



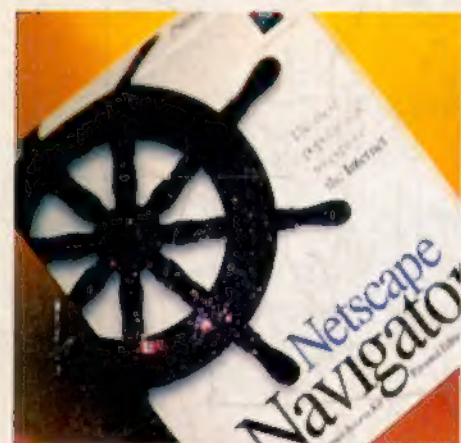
EDITORIAL
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PC Sound Crank Up the Volume with
25 of the Latest Add-On Speakers

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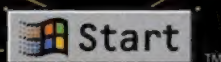


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Inside

Every year, sound becomes a more integral—and more important—part of the personal computing experience. Recently, the growing user demand for better sound, particularly that provided by high-quality PC speakers, is combined

with the expectation of continually lower computer prices, together presenting a considerable challenge to PC vendors. The \$10 giveaway speakers that were standard fare for a \$3,000 system a year ago are just not acceptable for a typical \$2,500 multimedia system today.

For now at least, this challenge is being met primarily by manufacturers of add-on speaker systems.

West Coast lab ran all 25 speakers through a battery of tests, using sophisticated signal-analyzer equipment in a semianechoic chamber.

Because judgments about computer sound quality—like your home stereo system's—are based more often on personal taste than on bottom-line prices and spec sheets, we added a round of subjective “jury tests” in the New Jersey home office/lab of our resident sound expert, Craig Stark.

Our review team was led by Jamie Bsales, our associate editor for hardware, and technical analyst Denis Tom. On the West Coast, project leaders Dave Salvator and Brian Fikes handled the Labs-based tests, while back East,

Craig Stark, staff editor Holly Aguirre, editorial researcher Michelle Schoenung, and contributing editor John Quain rounded out the team.

In short, in the last 12 months PC sound has benefited from crescendos of new technology (particularly in 3-D sound) and new products (such as high-powered, low-cost subwoofers). Our months of testing confirmed that PC sound is better than ever.

—Jake Kirchner



Tom, Bsales, and Aguirre know their speakers.

This issue of *PC Magazine* looks at 25 systems from 19 of those companies and details the state of the art for sound in the personal computing world.

Our in-depth review of PC speakers presented us with challenges of our own, requiring separate rounds of testing on both the West Coast and East Coast.

To obtain our laboratory results for such standard measurements as frequency response and total harmonic distortion, our

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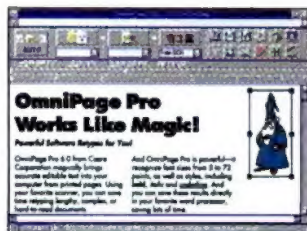
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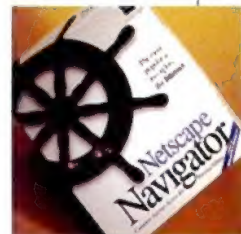
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THE BEST OF

1995

BY JAKE KIRCHNER

As the new year is upon us, we remember the thousands of new products that passed through our hands in 1995. And we've chosen our top 45 favorites—a few first-time winners, some stunning upgrades, and many Editors' Choices. Jim Seymour's tongue-in-cheek "Thumbs Up, Thumbs Down" and Don Willmott's year-end "Abort, Retry, Fail?" offer their own takes on last year as well103



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BY JOHN R. QUAIN

Are you really satisfied with the tinny-sounding speakers that came with your PC? With some vendors now offering everything from the latest in 3-D sound technology to subwoofers, you may want to upgrade with a new set of multimedia speakers. Take a look at the 25 speaker reviews in this issue, then take a listen.....159

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SERVING FROM A
SILVER PLATTER

BY STEVE RIGNEY

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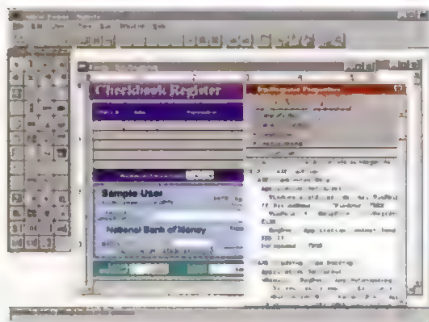
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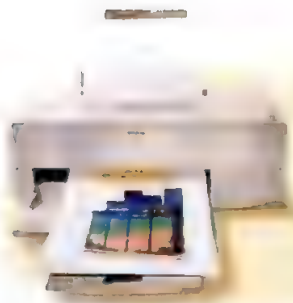
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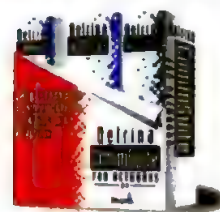
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CIRCLE 316 ON READER SERVICE CARD

Letters

In the weeks following Microsoft Windows 95's much-ballyhooed release, it seemed as if the new operating system was on everyone's mind. There was no shortage of opinions and anecdotes about Windows 95, and readers flooded our mailboxes with comments, observations, and reactions to the package.

WE'VE GOT WINDOWS 95 COVERED

Your coverage of Windows 95 was second to none ("Waiting for Windows 95," September 12, 1995). I was well informed by the time I bought my copies of Win 95 and Microsoft Plus Pack. In fact, I was practically bursting with knowledge before I even loaded the software. Thanks to your coverage I'm fully prepared and satisfied. Despite the negative views of some, Windows 95 is a great operating system.

STEPHEN D. WALDEN
via the Internet

Next December, give yourselves an Award for Technical Excellence for your issue of September 12, 1995. Your coverage of 17-inch monitors, Windows 95, and the next generation of software was superior. It was the best issue I've ever read.

SCOTT TRINGALI
Marlborough, Massachusetts

Thanks to your many articles on Windows 95, I knew exactly what I was getting into when I took the step to upgrade.

CHAD WALDMAN
via the Internet

After leafing through your Windows 95 issue, I got the impression that switching to Windows 95 is going to cost more than just the price of Windows 95 if your current hardware and software don't work properly with the new package. It's a big gamble for users to have to take.

MICHAEL FLOURNOY
via the Internet

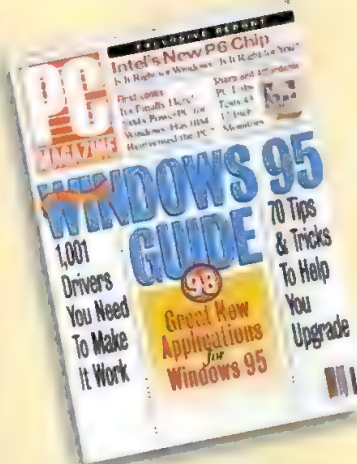
Thank you for the great coverage of Windows 95. Upgrading to Win 95 can be very painful for a lot of users. I've had some problems with the new software, but your magazine has provided several of the solutions.

W.D. BASELEY
via the Internet

Your story on peripherals, drivers, and Windows 95 was a great source of information.

MARK MANTIA
St. Louis, Missouri

There are millions of Windows 3.1 users out here—users who've not yet upgraded to Windows 95 and most probably will not be up-



Win 95 is not an attempt to clone the Macintosh; it's an incredible system in its own right.

grading for some time. Many end users cannot afford to install the new operating system, as that will mean they'll have to upgrade components not supported by Windows 95. Unfortunately, that leaves Windows 3.1 users in a lurch, as so much of your magazine is now devoted to Windows 95.

ED DUDENHOEFFER
via the Internet

Windows 3.1 users take heart: Even with the arrival of Windows 95, PC Magazine will continue its coverage of Windows 3.1 applications.—Ed.

OS/2 EXPANSION SLOT

Thanks for your coverage of OS/2. I especially enjoyed your new "Inside OS/2" column (September 12, 1995). In the onslaught of all things Windows 95, it is encouraging to see that *PC Magazine* has not forgotten the millions of users of the other 32-bit operating systems.

BRUCE MEISSNER
via the Internet

Your OS/2 column was excellent. It was great to read an in-depth article aimed directly at the OS/2 user for a change. Also, kudos for including at least some OS/2 program reviews in a month when most magazines are blinding me with their Windows 95 blitzkrieg.

SEAN PATTON
via the Internet

Thank you for including coverage of OS/2 Warp applications in your issue devoted to

Windows 95 ("What's New for OS/2?" September 12, 1995). I've test-driven the Win 95 beta, and I'll stick with OS/2 Warp—at least for now. I prefer OS/2 Warp's multitasking to Win 95's almost-as-good-as-NT variety. The Win 95 apps will have to be really good to get me to switch back.

DAN GONNEAU
Astoria, New York

HAPPY ENDINGS WITH WINDOWS 95

It was with some hesitancy and distrust that I installed Windows 95, but I was immediately impressed by the operating system's ease of use. The installation was flawless. My 8MB of RAM handled Windows 95 as well as it did Windows 3.1, and the 32-bit applications run even faster. I also discovered that Windows 95 is not an attempt to clone the Macintosh on the PC. Rather, it's an incredible operating system in its own right, one that cannot be compared with any other 32-bit OS.

BILL PAGE
via the Internet

My Windows 95 experience was a result of my frustration with the anything-but-user-friendly OS/2 Warp. I opened the Windows 95 box, inserted the CD-ROM, and within an hour was using all of my programs. Anyone want to buy a used version of OS/2 Warp?

DAVID L. MILLER
via the Internet

I installed Windows 95 without encountering a single problem; all components are working fine and I've been happily computing ever since. My experience thus far is that the operating system is outstanding—no crashes or bugs to be found.

GEORGE MOORE
Ashburn, Virginia

At first I was a little afraid to put Windows 95 on my computer. But I figured it was either now or never, so away I went. The installation went without a hitch, and Windows 95 is the best thing I've put on my computer in four years. It works wonderfully, and all of my applications perform perfectly—and speedily.

DANIEL BURNHAM
via the Internet

I made the leap of faith and installed Windows 95. The installation went very smoothly, and I was done within an hour. I've spent the last five days just exploring the new operating system, and I'm already starting to feel very comfortable with it. I particularly like the drag-and-drop feature, which makes it very easy to organize your files and desktop. And you can do all of this without feeling as if you're digging deep inside the sys-



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Letters

tem to change things. I also like the system tools that you can run without going to DOS. Overall, I'd say the look and feel of Windows 95 is great, and I'm glad I didn't wait to upgrade.

JIM BROOKER
Norwalk, Ohio

TAKING THE MIDDLE ROAD

Well, I finally got Windows 95 up and running. I upgraded most of my software, and I am impressed with the results. There are toolbars, buttonbars, taskbars, titlebars, statusbars, menubars, pop-up menus, pull-down menus, rollups, rolldowns, tooltips and context-sensitive help. There's only one problem: The mouse pointer just obscured the part of my document that was still visible.

GUNTER RICHTER
via the Internet

The consensus of the press seems to be that even if Windows 95 isn't the greatest thing since sliced bread, it's a worthwhile upgrade. My 386-based system will be approaching its fourth birthday come the first of the year. Perhaps then I'll take advantage of the after-Christmas sales and buy a new machine with Windows 95, Plug and Play components, and an armload of bells and whistles. Until then, however, I'm not holding my breath. And I can't wait until January 2, 1996, when Microsoft will be inundated with newbies asking the inevitable questions: "Why did I get stuck with last year's operating system?" and "How do I upgrade to Windows 96?"

CHARLES O'REILLY
via the Internet

Windows 95 may be the next great operating system, but I'll wait until all the problems have been sorted out. And until all the panicky messages on on-line support forums have died down.

STEVE D. COLCLOUGH
via PC MagNet

THE NAYSAYERS WEIGH-IN

As a user of both a Pentium PC and a Macintosh, I have to say that this Windows 95 thing has totally gotten out of hand. How long is it going to take people to realize that Microsoft is just trying to get as much money out of the PC user's pocket as it can. If Windows 95 was totally compatible with the existing PC world, I would say bravo for Microsoft. But in the coming months, it will become clear that Windows 95 is just another ploy by the computer industry as a whole—the tried-and-true, buy-the-operating-system-and-then-buy-the-software/hardware-to-make-it-run game. I find it hard to believe that all this hype and hoopla is about an operating

system that is almost as capable as a 1987 Macintosh OS.

G.D. VAN AIKEN
via the Internet

I pity the new users who'll get their start with Windows 95 having no past knowledge of Windows 3.1 and its user-friendly features. I like the added power of Windows 95, but I rate it as a zero on user friendliness. In its efforts to emulate the look and feel of the Macintosh, Microsoft went too far, dropping the conveniences of Windows 3.1 in favor of all the undesirable features of the Apple interface. For example, icons floating in space instead of being logically grouped according to functionality. Doesn't Microsoft realize that Windows 3.1 became so popular precisely because of its user friendliness?

EMILIO TRAMPUZ
via PC MagNet

Microsoft's brochure encouraging users to upgrade to the Windows 95 version of Microsoft Office heralded the new version as a reliable multitasking environment that would allow Office to run several applications at once, seamlessly and trouble-free. Sound familiar? Remember those advertisements way back when explaining how simple it was to run several applications at once? Remember the claims of how easily you could use the mouse to drag a spreadsheet from Excel and drop it into a Word document? Well, now Microsoft is saying that after all of those frustrating sessions with error messages and glitches, the problems have finally been solved and Office really does work the way Microsoft has been claiming it will work for the past four years.

CRAIG MOORE
via the Internet

OS/2 is still a better mousetrap than Windows 95. Having used Win 95 since it was released, I marvel that anyone thinks that this is an improved interface.

JAY HERMAN
via the Internet

File this one under "Postcards from the Bleeding Edge." I tried to make the switch from OS/2 Warp to Windows 95. After all, it's a "Windows World," isn't it? I ignored a bad omen as my CD-ROM player suddenly found CD disk labels unrecognizable during the Windows 95 Plus Pack portion of the install, but what was harder to ignore was the complete failure of the 2X CD-ROM player after the initial Win 95 reboot. I tried a new Media Vision 6X CD-ROM player, but evidently my Win 95 "Hardware Wizard" was having a bad day.

The Wizard swore my new CD interface card was a "Standard IDE/ESDI Hard Disk

CORRECTIONS AND AMPLIFICATIONS

In our Printer Blockbuster round-up, the correct toll-free phone number for Digital Equipment Corp.'s DECcolorwriter 550ic ("Good Enough, And Better," November 7, 1995) is 800-777-4343.

Controller", and all attempts to tell the Wizard otherwise derailed when it asked me to insert the Win 95 installation CD into the nonfunctional drive. Attempts to contact Microsoft proved futile—the entire world must be having problems with Windows 95. Perhaps it's time to reload OS/2 Warp.

SCOTT MOTTET
Waukesha, Wisconsin

Despite Microsoft's claims on the Win 95 box, all of "today's software" does not work well on Windows 95. The biggest problem I've had is getting 16-bit client applications to run under new 32-bit apps. Microsoft does not warn its customers that upgrading to the new version of Office will result in other associated 16-bit programs not working. Meanwhile, I'm left with fax and OCR software that I paid for but can no longer use. I've been screwed, but I'm not quite sure by whom.

JON D. MORROW
New York, New York

Now what am I supposed to do? I taught myself how to use a computer, first using DOS, then Windows. Now Windows 95 comes out, my computer isn't able to handle it, and I find myself falling back into the world of the ignorant. Oh well—back to coin collecting.

L. P. FREY
Chesterfield, Missouri

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Meridians with unretouched photo of active matrix displays.

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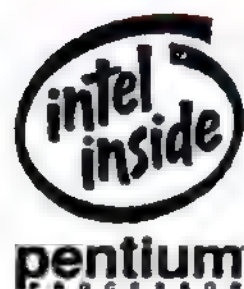
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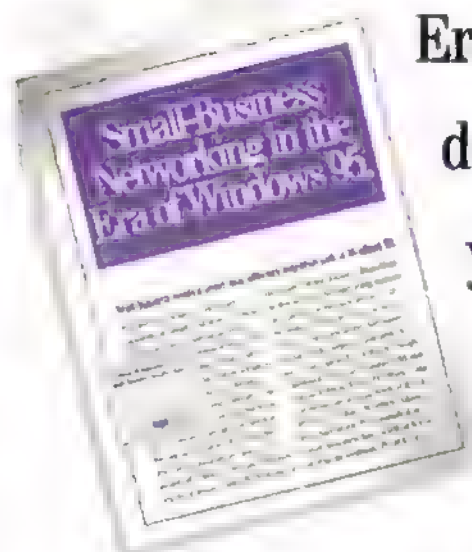
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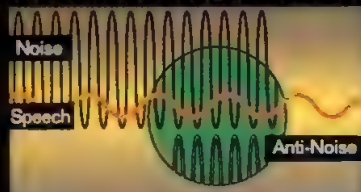
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Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

The Web Minus the PC

New devices put the whole Web in your hand.

The marriage of World-Wide Web applications with a reincarnation of the dumb terminal is attracting big backers. Sun Microsystems' Scott McNealy, Compaq's Eckhard Pfeiffer, and Oracle's Larry Ellison are all behind the idea of hardware for portable, quick-

in, quick-out access to Internet applications—and little else.

While the concept of a \$300 to \$600 Web terminal is drawing much industry support, for some, including *PC Magazine* columnist John Dvorak, the effort aims to resurrect the "diskless terminal, the same device we ditched a decade or more ago."

Sun Microsystems' Java programming language for writing Web applications is behind much of the Web-terminal hubbub. Java, which attracted more than 1,000 developers at a recent conference, will be in the next version of MacroMedia's Director, software for developing multimedia apps, as well as in Oracle's new WebSystem software, which facilitates Web connections to Oracle7 or Workgroup databases.

If Java applets take off on the Web, a new, storageless, low-end hardware category could emerge. According to officials at Sun Microsystems, "We think the potential of Java applets is in distributing 'borrowed'

data and applications with very little regard to the hardware you're running." For example, using portable hardware that consists of an inexpensive display, a processor, minimal on-board memory, and a communications port, you might access an applet in your

company's retirement-plan database and make a quick change to your 401K plan.

PDA makers are betting that hand-held devices will be the ultimate Web terminal. By January 1996, Sony's new Magic-Link PDA will offer Web access. According to Sony's Alex Gruzen, "The Web-in-your-hand concept will open the PDA up to tons of on-line applications and data-delivery tasks."

While storage, speed, and versatility are huge

advantages for PCs over such devices, the on-line explosion is sending hardware and software makers back to the drawing board. Sun Microsystems' first low-end devices are due in 1996, as are Compaq's disposable PCs and browser-enabled PDAs.—*Sebastian Rupley*

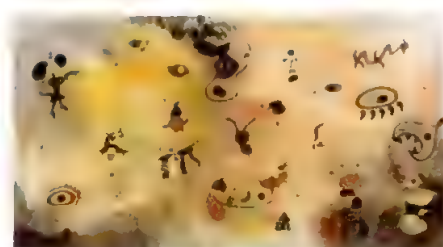


Weird New Worlds For On-Line Chats

A FUNNY THING IS HAPPENING ON the way to the on-line chat forum these days. Artwork as a form of on-line chatting? Microsoft's virtual worlds group, part of its advanced technology and research division, has turned this far-out concept into a technology that it hopes we'll all be using to communicate over The Microsoft Network. After all, what better way to communicate than by floating as an avatar (an on-screen animated representation of yourself) inside a Miro-like painting with some on-line buddies as ambient sounds gurgle in the background. It sets a mood, right?

"It's about art, not technology," says Linda Stone, director of the virtual worlds group. She and Rick Raddatz, lead program manager, have developed V-Chat Technology, which lets you view rich, graphical scenes on your PC while controlling an avatar—all over a 14.4-Kbps modem and without smacking into a bandwidth bottleneck. They've developed a two-step approach to building an environment: First, you "publish" your avatar, then you download a file of all your avatar's talents such as smiling, waving, and walking.

Stone expects three types of forums to evolve: topical forums that focus on a single interest (for example, a movie lobby will beckon film buffs); branded lobbies that promote the products of the sponsor (NBC or Paramount, for example); and generic chats. "Our interface visually helps you find threads in the cacophony of voices," she explains. Initially, Microsoft is setting up environments for music, movies, and kids. —*Carol Levin*



Bug World is one of the upcoming virtual chat environments on The Microsoft Network.

Pipeline By Jake Kirchner

57 Channels (and Nothin' On)

I guess it doesn't surprise me that my friends, neighbors, and family have given up all polite pretense of heeding my advice concerning the Internet. Despite my year-long admonitions against spending time or money connecting to the Net, it seems every last one of them is now rushing headlong onto the information expressway. Given the nonstop Internet hype they're exposed to, who can blame them?

It's not that I'm anti-Internet. In fact, I'm on the World-Wide Web several times a day. And I get more Internet mail nowadays than faxes. Rather, I worry that many people will find the Internet—at this stage of its development—a big disappointment. It's still relatively hard for newcomers to get around and find things on the Net.



I hate the thought that someone might spend hundreds, perhaps thousands, of dollars acquiring new hardware, browsers, on-line accounts, and who knows what else (ISDN lines?) to get connected, only to come back to demand: "This is what I'm getting for my money?" If you think of all the disappointed people who signed up for every premium channel when cable first came to their neighborhoods, you'll get the idea.

I suspect I'm no different in this regard from the *PC Magazine* reader. You probably get a lot of the same questions from computing and network neophytes: "Do I really want Windows 95?" or "Okay, what is a baud anyway?" they ask to break the ice. All the while you know they're working up to the real question on their minds: "What's this Web thing I keep hearing about? Do I need to be there or what?" You can practically smell the money smoldering in their pockets.

Advising them to head for the Net is like telling a former mendicant friar, "Well, now that you're no longer living in a cave, the first thing is, you sell your sandals and get yourself a television set." The proposition just doesn't survive the most basic cost/benefit analysis. On the plus side, as TV programming sinks lower in quality, the Internet has more value every day.

Not that it matters much, I suppose, considering that the PC buying frenzy of the holiday season that just ended has primed several million more households to head for the Web. Trying to hold them back is like trying to subdivide water. You just get zero cooperation.

By the time you read this, the wired nation will be a done deal. I know that from personal experience. Both my kids have found their own way onto the Internet via America Online and now boast their own Internet addresses. My wife came home the other day with a free Internet account provided by the local public library. And today AT&T announced it's offering free Internet access to just about every school in the country. Excuse me while I stand out of the way and cover my eyes.

I exaggerate, of course. There's a world of information and entertainment on the Net. And I don't mean just the top-flight content at <http://www.zdnet.com>. We know the value of the Net because we've discovered it ourselves. To help speed you on your own way, the *PC Magazine* staff has scoured the Web to find the very best sites on art, commerce, computing, government, education, the Internet, and much more. Rather than wander aimlessly, let your first stop be our Top 100 Web Sites at <http://www.pcmag.com>.

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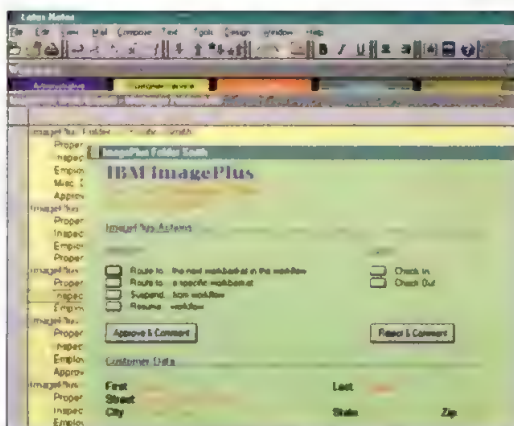
Jake Kirchner is the editor of PC Magazine.

Lotus and IBM Combine Technologies

FIVE MONTHS AFTER IBM ACQUIRED Lotus Development Corp., the two companies delivered the first fruits of their marriage. IBM Imaging Technologies and Lotus have developed a class of applications that combines their technologies, extending IBM's high-end imaging archive, ImagePlus, to Lotus Notes users.

A product that had in recent years languished in the recesses of the back office, ImagePlus can now potentially reach two million Notes users worldwide. The first IBM product redesigned with Notes capabilities, ImagePlus is an image repository that's now positioned as a centrally managed home for vast quantities of documents and images.

"The integration of an image-processing system and a groupware product solves many of the problems of conventional imag-



Notes users can now access images stored in ImagePlus.

ing systems," says Bruce Silver, an image-management consultant in Weston, Massachusetts. Since Notes users can be

thousands of miles away from the server on a wide-area network, the imaging application is no longer confined to one department or to users whose PCs are physically connected to the image server. For instance, a claims adjuster on the road could fill out forms and take pictures of an accident with a digital camera and bring the images into a Notes document.

The technology to link Notes with imaging applications has been around for a while. Lotus Notes: Document Imaging started shipping for free in all copies of Notes back in April. And more products are on the horizon. Action Technologies, ViewStar, and Wang are developing software that builds on the workflow extensions to Microsoft Exchange. And FileNet is developing a workflow module as part of Novell's Groupwise messaging platform.

—Carol Levin and Ben Z. Gottesman

Not Appearing on a PC Screen Near You

HAVE YOU NOTICED THE MPEG-mania that's swept over you the last 18 months? Promises, promises.

By now, CD-ROM titles that use high-quality MPEG video compression should be flooding store shelves. Instead, CD-ROM publishers are shying away from the market because their titles don't play reliably on the variety of MPEG playback cards and software on desktops today. This unstable playback environment is discouraging CD-ROM title developers from releasing MPEG titles and is stifling further growth.

The problem is two-fold. First, data-format incompatibility prevents files created by certain MPEG compressors from playing back on certain MPEG players. Publishers can avoid this issue by using mature MPEG compression hardware and software from companies like FutureTel, Minerva, Optibase, and Sigma Designs or from experienced service bureaus like Laser Pacific or IBM.

The second problem is at the programming level, and it isn't simple to resolve. The MPEG playback application programming interface (API) is called the Open MPEG-1 MCI specification (OM-1), which contains 29 instructions, some with as many as ten options. The sheer complexity of the specification has resulted in inconsistent implementations among the many vendors of playback hardware, especially off-shore clones, which typically grab significant market share among bargain shoppers.

To date, the OM-1 Foundation, charged with policing the specification, has been relatively ineffective. Now, VIS Development Corp. of Waltham, Massachusetts, an MPEG title developer, has started a grassroots effort to address the API issue.

VIS Development has worked extensively with the OM-1 specification while developing over 180 custom MPEG CD-ROM titles for customers. The company has produced a CD-ROM containing a short video sequence that exercises all OM-1 calls and variations and is offering it at no charge to CD-ROM developers.

The good news, reports Andrew Snider, VIS Development's managing director, is that first-tier vendors such as C-Cube, Compaq, IBM, Jazz Multimedia, S3, and VideoLogic have enthusiastically embraced the concept and have thoroughly tested their players. The bad news: None of the over-thirty Pacific Rim vendors who received the disk have responded.

Snider's advice to title developers is simple: "Test all the mainstream playback devices and include a recommended play list with your title. While you may lose some sales, you'll avoid most of the tech-support headaches."

To buyers of MPEG hardware he advises, "Don't buy an MPEG player from a company that hasn't shipped an MPEG product for at least six months. It takes that long to shake out the API." In the long run, Snider predicts that clone manufacturers will either comply with the API or go away.



As the fine print indicates, this MPEG title—and many others—run only on certain video cards.

In the short run, however, his best advice is caveat emptor: Let the buyer beware.

—Jan Ozer

3-D Web Worlds

VIRTUAL REALITY ON THE WORLD-Wide Web is finally taking off, and the race is on to demonstrate the rich potential of 3-D Web sites. The race is also on to claim ownership of the key standards behind what may become the successor to the reigning HTML standard.

At this time last year, the virtual-reality modeling language (VRML) standard, now in Version 2.0, was more talk than reality. Now, enough new approaches to browsing and creating virtual reality are in place that standards may be in danger of becoming fragmented. According to Anthony Rockliffe, executive producer of Cybertown, "Extensions to VRML are being proposed

3-D, virtual-reality-based representations of oneself that can be moved through virtual worlds. According to Rockliffe, most proposed extensions to the VRML standard involve adding more interactivity.

The early crop of virtual-reality sites on the Web is nothing if not inventive. At the Cybertown site (<http://www.direct.net.com/cybertown>), the beginnings of a complete virtual-reality-based city are in place. At the site, you can click on the "The Colony" and download the World's 3-D Virtual Reality viewer to establish, tour, and set up your own virtual-reality-based apartment in town. You can even develop virtual-reality-based apartment complexes. Complete virtual-reality-based malls are in the works. For a more complete city tour in virtual reality, download the World-



One of several virtual worlds on the Web, CyberTown invites you to set up your own apartment. A virtual shopping mall is under construction.

left and right, and there's worry that standards wars may erupt."

With companies ranging from Netscape to Virtus seeking to establish their own virtual-reality browsers and development tools, such standards wars could easily arise. VRML Plus is the most hotly debated new extension to the VRML standard. The proposed extension to VRML 2.0 allows for the manipulation of standardized avatars—or

View virtual-reality browser (<http://www.planet9.com/vrsoma.htm>) and tour San Francisco's South of Market Street Area. Intel is working on some extensive new virtual-reality-based worlds designed to advertise the company and its partners' products. Demonstrations will be in

place soon at Intel's Web site (<http://www.intel.com>).

According to Cybertown's Rockliffe and Virtus's president David Alan Smith, bandwidth bottlenecks currently stand in the way of widespread Web-based virtual-reality sites. But both foresee cable modems and upcoming price reductions in graphics acceleration hardware as key enabling technologies.—Sebastian Ruple

Flat Panels and PDAs Take Center Stage in Osaka

THE PDA IS ALIVE AND WELL—IN Japan, that is. From palmtop computers galore to blue-laser CD-ROM drives to head-mounted virtual-reality display panels, this year's Japan Electronics Show—a gathering of Japanese developers and Japan-based arms of companies such as IBM—was one of the biggest ever.

As you might expect from a country with a giant manufacturing base, the majority of floor space was devoted to individual components such as diodes and flat-panel displays. Developers also previewed products that may in the future find their way in some form or other to the U.S.

While Japan has lagged behind the U.S. in the adoption of PCs—sales of computers have only recently caught up with the dedicated word processor—Japan tends to be a technology trendsetter.

The PDA market has met with greater success in Japan than in the U.S., partly for linguistic reasons. Since Kanji characters are written with specific stroke combinations, handwriting-recognition software is accurate. At the show, Panasonic and Sharp displayed a large line of palmtop computers, and Sharp divulged plans to build color LCDs into future versions of its PDAs.



Sharp and Panasonic have introduced several PDAs in Japan.

The big splash at the show was Digital Video Disc (DVD), or rather, its absence. DVD is the proposed high-density CD standard that is poised to boost data storage on the PC and replace the laserdisk. Since industry players agreed on a DVD standard too late to demonstrate prototypes, they were only able to show earlier DVD products, including Sony's MMCD (MultiMedia CD) and Toshiba's SD (Super Density) players. Toshiba also previewed a blue-laser CD-ROM technology that stores up to 15GB of data, but don't expect it to be a consumer product any time soon.

Flat-screen technologies were also big hits, with a heated rivalry developing between the liquid-crystal display (LCD) and plasma display camps. Sharp, the leader in LCD technology, had a number of small (10.4-inch and 8.5-inch) TFT television sets priced at over \$1,000. It also previewed some impressive flat-panel LCD color-display prototypes, including a stunning 17-inch model that displays up to 1,280-by-1,024 resolution—though only with 512 colors—and a 21-inch, 640-by-480 display with 65,000 colors. Sharp is now working on perfecting a technology that mates two or more panels together to create a larger display for the company's 28-inch and 42-inch televisions. Until the cost of manufacturing these displays comes down significantly, don't expect them to replace your bulky desktop monitor any time soon.

Panasonic claims its plasma displays will be less expensive than LCDs but will suffer from lower brightness and higher power consumption than LCDs. Sony's

hybrid Plasmatron combines plasma and LCD technology into an impressive television. Sanyo demonstrated a three-dimensional LCD designed for virtual-reality games. And Sharp showed its new Viewcam, which has a 5-inch, 224,000-pixel LCD display. The previous 4-inch, 180,000-pixel screens are now finding their way into head-mounted displays. Look for these panels in new virtual-reality headsets.

The Sony Mini Disc (MD), so far a bust in the U.S., is steadily gaining popularity as a replacement for the cassette tape in Japan. Over 800 prerecorded titles, primarily from Sony Music, are now available. The MD format stores about 140MB of data (74 minutes of audio) in a very small cartridge. Many companies, including Sharp and Sony, are pushing the MD Data format. With the proposed MD 2.0 stan-



A leader in LCD technology, Sharp has developed slim TVs (shown here) as well as a 21-inch color flat-panel display.

dard doubling data storage and with dual audio and data functionality, it's possible that the MD standard could compete in the market niche now dominated by Iomega's ZIP drive. With enough support, the MD standard could emerge from Japan as a standard for both portable data storage and consumer audio.

Although the Internet phenomenon doesn't have the same momentum in Japan as in the U.S., JVC demonstrated an America Online-like service, along with World-Wide Web pages of some vendors. An Internet Cafe where tired showgoers relaxed, sipped coffee, and surfed the Net proved to be the show's most popular American import.—Bernie Yee

Top Retail Software

Current ranking	Last issue	Product, company
1	—	Quicken 5.0 for Windows Intuit Inc.
2	—	Quicken Deluxe 5.0 for Windows Intuit Inc.
3	1	SoftRAM 95 Synchronys Software
4	—	Quicken Financial Suite Intuit Inc.
5	—	Netscape Navigator, Personal Edition Netscape Communications
6	—	WordPerfect 6.1 Upgrade Novell Applications Group
7	10	ProComm Plus 2.11 Datastorm
8	4	Simply 3D SuperPack 1.0 Visual Software
9	—	MS Publisher 3.0 for Windows 95 Microsoft Corp.
10	—	Calendar Creator Plus 3.0 SoftKey International

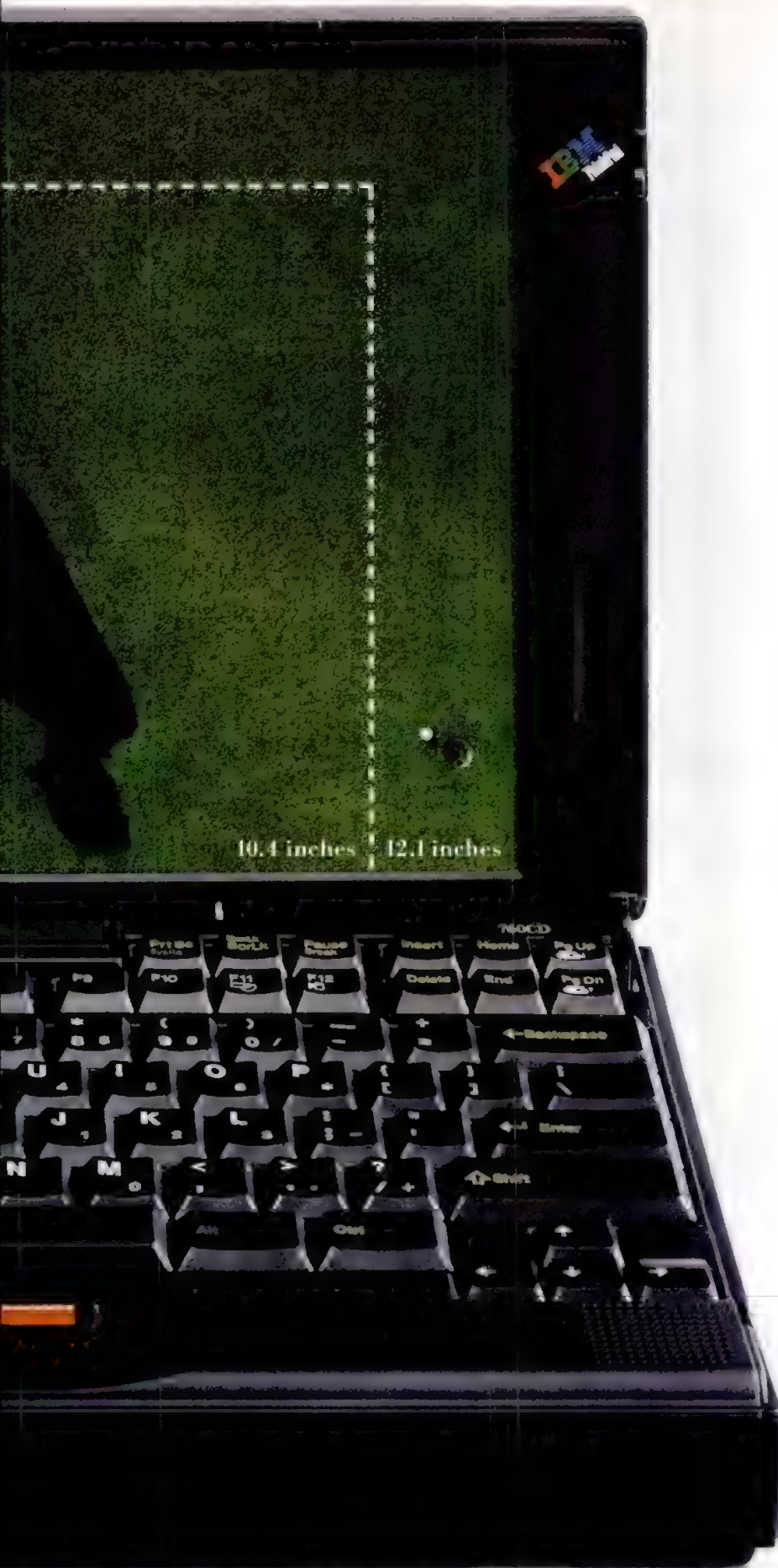
This list ranks PC business programs according to the total number of copies shipped to over 12,000 stores and resellers in the week ending October 28, 1995; the list cannot be interpreted as a picture of the entire software market. Adapted from a compilation by Ingram Micro.

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

VIDEO COMPRESSION

Indeo Sets the Standard for Video Quality, but Some Features May Be Ahead of Their Time

By Jan Ozer

Intel's Indeo video interactive (IVI) is a brilliant stroke of marketing-fueled engineering that probably won't fully blossom until the close of 1996, when the average computer catches up to this spectacular video-compression software. By then, the elements needed for IVI to succeed—a 133-MHz Pentium running Windows 95 with DirectDraw graphics—will be common. IVI debuts several new game-oriented features that make the program a key weapon in Intel's competition with platforms such as the Sega Saturn and the Sony PlayStation.



SIDE BY SIDE: Indeo video interactive provides high-quality playback.

IVI provides the best software-based playback quality that we've seen but still lags behind hardware-assisted MPEG-1 decompression. The price for this quality is system hardware: IVI requires at least a Pentium/90 for smooth playback.

Intel designed IVI from the ground up, replacing Indeo 3.2's vector-quantization technique with a more sophisticated hybrid wavelet-based algorithm. To maximize video quality, Intel incorporated bidirectional prediction, the

interframe compression technique used by MPEG.

Complementing the wavelet technology, Intel made IVI scalable from the outset. When the system reaches its limit, IVI can perform partial frame decoding as an alternative to dropping frames. This improves perceived playback speed but at the cost of image quality. Finally, Intel included a method of targeting the playback platform, allowing developers to get the most out of the hardware.

IVI includes an array of advanced features, including support for transparency or blue screening (which enables video sprites and other overlays to be incorporated), local window decoding (which gives developers real-time access to multiple video streams), random keyframe access (which improves interactivity), and adjustments for saturation, contrast, and

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SCANNERS

HP ScanJet 4s and Visioneer PaperPort Vx: Nearly Identical Twins That Were Separated at Birth

By Alfred Poor

Not since Danny DeVito and Arnold Schwarzenegger starred in *Twins* have twins been so different from each other as the new personal monochrome scanners from Hewlett-Packard and Visioneer are. Both the \$349 HP ScanJet 4s and \$369 PaperPort Vx are based on the same Visioneer single-sheet hand-feed scanner, which has gray-scale support and transfers information to the PC without the need for a SCSI host adapter. But each goes its own way as far as features and software; they are two radically different products.

Both desktop scanners look more or less like high-tech rolling pins. There's a top cover that slides back and forth so that scanned pages can exit through either the front or the back of the scanner. The front exit is convenient, but you'll need to keep the space be-

hind either scanner clear, because you need to use the back exit for scanning small items such as business cards or stiff paper stock such as photographs. Although the scanner is low enough to fit in front of most monitors and not obstruct the view, the need for rear clearance will likely keep you from using the scanner in front of your monitor.

EASY IMAGES

The PaperPort software that is used on both systems is a Windows 3.x application and includes a driver that automatically loads the program when the scanner senses that you have inserted a sheet of paper; there is no button or switch to start scanning. Images are scanned di-



TWO PEAS: These personal scanners from HP and Visioneer have slightly different housings and prices, but the real differences are found in the software and features.

rectly onto the program's Desktop, where you can rotate them, add annotations and notes, and combine them with others to make stacks. At this point, you can easily send them to other applications, such as your word processor or

Continues on page 39

Indeo Interactive

Continued from page 37

brightness (which let users customize video for their displays). IVI also can be password-protected, letting developers protect their videos from being edited or played back on unauthorized programs.

These features require special programming to an Indeo-specific interface, rather than working through Video for Windows controls. From a practical point of view, these features will not be accessible to nonprogrammers until IVI's specific controls are designed into popular presentation or high-level authoring programs.

We focused our evaluation on the features accessible to the widest range of users: pure compression quality and linear playback performance. We also looked at how well IVI handled scalability, bidirectional prediction, and compressing for several

different target platforms. We compared the results with those of Cinepak, Indeo 3.2, TrueMotion-S (see the sidebar), and FutureTel's PrimeView MPEG compressor played back with CompCore Multimedia's software-only MPEG decompressor. We used two test-beds: a Gateway Pentium/60 equipped with a double-speed CD-ROM drive and a Matrox Millennium graphics card, and a Gateway Pentium/133 with a quad-speed CD-ROM drive and a STB PowerGraph 64 video card.

IVI is a very slow video compressor, especially with bidirectional prediction enabled. Cinepak and Indeo 3.2 were four times as fast as IVI; TrueMotion-S was ten times as fast. Bidirectional prediction also triggered one of IVI's most disturbing flaws—severe frame dropping during the first few seconds of playback. Intel is aware of this shortcoming, which is most severe on low-end computers

with bidirectional prediction enabled.

Jury tests that compared files with and without bidirectional prediction found little quality difference between them. This advanced technique slowed the video display rate by 2 frames per second (fps).

IVI's new scalability feature was similarly uninspiring, increasing the display rate of the bidirectional predicted file by 2 fps but producing very noticeable pixelation on all sharp edges and occasional severe frame dropping. The only new control that worked as advertised was the low, medium, and high target platform switches, which trade off a slight quality difference for a couple of frames per second in playback speed.

FIRST LOOKS PLUS

From January 2 to January 5, go online to discuss Indeo video interactive with Intel product executives and Jan Ozer, a reviewer at PC Magazine Type GO EXEC on ZD Net/CompuServe Edition.

We produced the best results with bidirectional prediction disabled, and the target platform set to high. We used these settings for our quality comparisons, compressing 320-by-240 clips at 15 fps using a data rate of 200 kilobytes per second (KBps).

IVI outperformed all software-only codecs, producing more vivid colors, sharper details, and significantly less background noise, which was especially noticeable when scaling the video to higher resolu-

tions. IVI's results also surpassed MPEG-1's, albeit in a somewhat unbalanced competition, since MPEG-1 plays back at 30 fps rather than 15 and is compressed to 150 rather than 200 KBps.

Playback tests were less encouraging. In 30-fps tests from the hard disk of our Pentium/60 test-bed, IVI displayed 20 fps, compared with 30 fps for Cinepak, Indeo 3.2, and TrueMotion-S and only 12 fps for CompCore's software MPEG player. From the CD-ROM drive, however, IVI produced only 8 fps, compared with 15 fps for Cinepak, Indeo 3.2, and TrueMotion-S.

More disturbing was IVI's start-up latency, where the video jerked and jumped for up to 5 seconds before playing smoothly. Since we couldn't reproduce this on our Pentium/133 PC, we couldn't determine whether this was a bug or just a symptom of an underpowered computer. Either way, IVI appears best targeted at computers that have Pentium/90 or better processors.

On the whole, Intel might have been better served by not including scalability and bidirectional prediction in this initial release. Nonetheless, IVI clearly sets new standards for interactivity and video quality. That is, if your PC is powerful enough to make the most of it.

Indeo video interactive. List price: Free. Requires: 16MB RAM, 1MB hard disk space, Microsoft Windows 95, Windows 3.1 or later. Intel Video Technology, Hillsborough, OR; 800-628-8686; Web, <http://www.intel.com>.

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Video with Fewer Compromises

Whereas Indeo video interactive may be tomorrow's codec, Horizons Technology's TrueMotion-S Compressor may be today's solution. TrueMotion-S works best at or above a data flow of 250 kilobytes per second (KBps).

TrueMotion-S uses a proprietary intraframe-only 15-bit algorithm based on technology licensed from Duck Corp. Horizons ships three compression modules, Windows 95 (\$695), Windows 3.1 (\$595), and Macintosh (\$495), with support for decompression on Unix platforms as well. Each package includes 500 free decompression modules; royalties apply for additional units. TrueMotion-S supports QuickTime, QuickTime for Windows, and Video for Windows, and works with capture boards, editing programs, and presentation-and-authoring programs that support these popular architectures.

Unlike most other codecs, TrueMotion-S does not allow users to select a target data rate. Instead, the user manipulates controls such as those for compression, color resolution, and detail to reach the target bandwidth. To achieve maximum compression, TrueMotion-S requires a horizontal file resolution that is evenly divisible by 12, which is why most TrueMotion-S files are 312 by 224 pixels rather than the more popular 320-by-240 window.

During compression, video quality and file

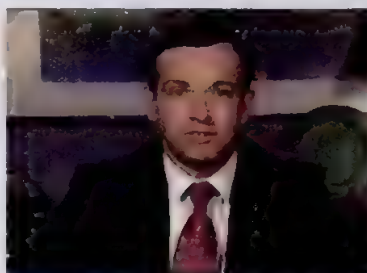
bandwidth vary by content, even with the same settings. Compression to a fixed data rate is a trial-and-error process. On the other hand, TrueMotion-S was faster than Cinepak, Indeo 3.2, and Indeo video interactive.

We tested two 232-by-224-pixel video clips at 15 fps, compressing to a range of bandwidths. At approximately 200 KBps, colors

appeared slightly faded, edges lost their crispness, and background noise was pronounced. At this bandwidth, TrueMotion-S provides little advantage over other codecs. At 250 KBps, where Cinepak and Indeo 3.2 reach top quality, TrueMotion-S video continues to improve, approaching MPEG-1 quality at about 300 KBps.

Although software-only MPEG-1 and Indeo video interactive offer similar quality at lower bandwidths, neither performs well on anything slower than a Pentium/90 PC. If your target video consumers need these performance specifications and quality is your primary concern, TrueMotion-S may be an excellent option.—JO

TrueMotion-S Compressor. List price: \$695. Requires: 16MB RAM, Microsoft Windows 95 or Windows 3.1, Video for Windows, video-capture card. Horizons Technology Inc., San Diego, CA; 800-828-3808, 619-292-8331; fax, 619-292-7321.



TALKING HEAD: TrueMotion-S provides high-quality video images.

First Looks

Scanners

Continued from page 37
your graphics editor.

One handy feature of the PaperPort program is its links to popular programs. PaperPort checks your system for any programs that it recognizes and adds them to a row of icons at the bottom of the main screen. At present, the software recognizes more than 100 programs, such as Adobe Photoshop, WinFax PRO, and Word for Windows.

You can then drag any image or stack of images to the icon to send that data to the chosen program. If necessary (as for a word processor or spreadsheet), PaperPort will automatically run the bundled optical character recognition (OCR) software, Caere OmniPage Lite, to convert the image data to editable text.

NECK AND NECK

Showing their lineage, the two scanners were nearly identical in terms of scanning speed. To scan a single sheet of text at 400 dots per inch (dpi) and 1-bit (black-and-white) the ScanJet 4s took 28.5 seconds, while the PaperPort Vx took 26.1 seconds. To convert that page to text and open it as an editable document in Word for Windows took the ScanJet 4s 38.4 seconds and took the PaperPort Vx 39.3 seconds. During testing, both systems produced about the same number of mistakes in the OCR conversion over a variety of sample documents.

The only noticeable difference came when scanning an 8- by 10-inch glossy photo at 200 dpi and 4-bit gray-scale. The ScanJet 4s finished in 40.3 seconds, compared with 50.2 for the PaperPort Vx.

In spite of these similarities and shared features, there are two important differences between the two products that add up to the ScanJet 4s taking a backseat to the PaperPort Vx. First, the ScanJet 4s is limited to 200-dpi optical

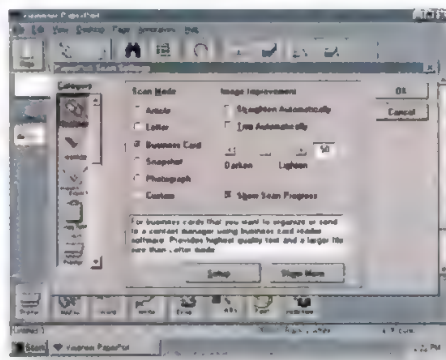
SIDE BY SIDE

Each of these scans was made at 200-dpi resolution, but the PaperPort Vx's 8-bit gray-scale data (right-hand image) produces a better image than the ScanJet 4s's 4-bit scan (left-hand image). This is primarily a result of Visioneer's innovative SharpPage image-enhancement software.



scanning, although images can be enhanced to 400 dpi. The PaperPort Vx is capable of optical resolutions that are 200 dpi horizontally and 400 dpi vertically.

In addition, though the two scanners come with Visioneer's PaperPort software, the ScanJet 4s uses the older Version 3.0 instead of Version 3.5, which comes with the PaperPort Vx. The big difference is that Version 3.0 doesn't include Visioneer's Folder feature to store images and groups of images under individual headings. Instead, on the ScanJet 4s all your images remain in the program's Desktop until you delete them.



ADAPTABLE: The PaperPort software comes with a number of predefined scan modes and a Custom setting that you can configure yourself.

Another important difference is that the ScanJet 4s has only 4-bit gray-scale support, which means that it is limited to just 16 shades of gray. Though this is sufficient to show tonal differences in simple artwork, scans of photographic images show pronounced posterization. The PaperPort Vx has 8-bit gray-scale support; the 256 levels of gray are sufficient for reproducing high-quality black-and-white photographic scans.

The PaperPort Vx also uses Visioneer's SharpPage Technology, which is designed to enhance the contrast. This feature makes text on a colored background much easier to read than with other scanners.

PARALLEL OR SERIAL, YOUR PICK

A major differentiator between the two scanners is how you connect them to your PC. Both scanners can connect through the serial port, but the PaperPort Vx also offers parallel-port support. Although this feature was not shipping in time for testing, it is expected to be ready by the time you read this review. All registered PaperPort Vx owners will receive the upgrade for free.

The PaperPort Vx also comes with extra software. There is a copy of CardScan SE from Corex, which makes it fairly easy to convert business cards to editable entries in this Rolodex-style PIM. Be warned, though: This technology is still not mature, and even little things like a photo on a business card or the use of a foreign language can render a scanned card's information garbled.

During our evaluation, we found that only one of a dozen business cards selected at random converted without errors, but most cards converted well enough to make CardScan quicker and easier than typing from scratch. You also get a copy of PictureWorks Copier, which adds scan-to-printer features that turn the scanner into a rudimentary photocopier.

Between the two, the clear winner here is the Visioneer Pa-

perPort Vx. The PaperPort Vx's price tag, which is \$20 higher, is more than compensated for by the unit's deeper abilities: more bits per pixel for more gray-scale levels, more software, and more features. If you want the HP name or have already purchased a ScanJet 4s, Visioneer will sell you an upgrade package for \$99 that adds most of the missing features, but you're better off just buying the PaperPort Vx from the start.



DIGITAL PERSONA: Visioneer's PaperPort Vx comes with CardScan SE for turning business cards into editable PIM data.

HP ScanJet 4s. Estimated street price: \$349. Requires: 4MB RAM, 4MB hard disk space, serial port, Microsoft Windows 3.1 or later. Hewlett-Packard Co., Direct Marketing Organization, Santa Clara, CA; 800-722-6538, 208-396-2551.

Circle 434 on reader service card
PaperPort Vx. Estimated street price: \$369. Requires: 4MB RAM, 10MB hard disk space, serial or parallel port, Microsoft Windows 3.1 or later. Visioneer Inc., Palo Alto, CA; 800-787-7007, 415-812-6400, fax, 415-855-9750.

Circle 435 on reader service card

UTILITIES

CleanSweep 95: The First Windows 95 Deinstaller

By Edward Mendelson

The massive sales of Windows deinstallation programs suggest that users are almost as eager to remove programs from their system as they are eager to install them. Quarterdeck Corp.'s \$29.95 CleanSweep 95 is the first deinstaller designed specifically for Windows 95, and although it's still rough around the edges, it will likely pay for itself in restored disk space.

The heart of CleanSweep is the module that removes applications; moves them to a different drive, directory, or computer; or archives them in compressed form. Other modules search for orphaned .INI files, duplicate files, and other redundant or rarely used files. A well-designed background module records changes made during installations and a far less useful background module warns you if any files on your computer haven't been recently accessed.

Even with Windows 95's Add/Remove Program feature, you still need deinstallers to get rid of directories and miscellaneous files that the feature leaves behind. CleanSweep works best when removing programs whose installation it monitored. Like all deinstalling software, CleanSweep tends to miss some .VBX and other files when removing programs whose installation it didn't monitor.

Even when removing an application that it monitored during installation, CleanSweep sometimes gets confused. ClarisImpact, for example, installs a set of fonts in WIN.INI, but CleanSweep doesn't take account of the fact that Windows 95 automatically moves WIN.INI font listings to the Registry when you reboot. On our test, CleanSweep offered to remove the font listings from WIN.INI when removing the application. It then falsely claimed that it removed the listings, though the fonts remained listed in the Registry and thus installed in the system.

Unlike earlier versions of

CleanSweep, as well as most other deinstallers, CleanSweep 95 doesn't maintain a database on your system but rescans your disk every time you run it. On a 133-MHz Pentium system with a 2GB hard disk, this took almost 40 seconds, but you can set the scan to work in the background. With many 16-bit applications, the install monitor fails to record newly added files, although the file-removing module in the main program finds the new files successfully.

Despite many minor flaws, CleanSweep 95 is an essential purchase for anyone who experiments with Windows 95.

CleanSweep 95. Estimated street

PIMs

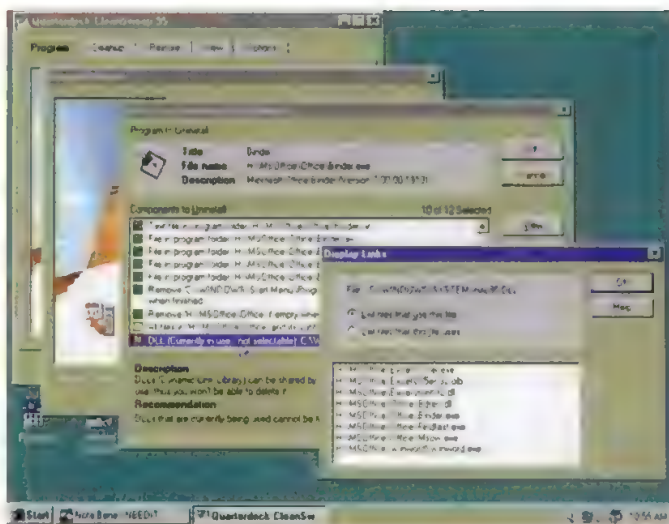
Info Select 3.0: The Personalized PIM

By Barry Simon

Micro Logic Corp. has found a niche among personal organizers by developing software that handles all the bits of information that don't fit into traditional PIMs. Although Info Select 3.0 for Windows exhibits many of the same idiosyncrasies that characterized earlier versions, the \$149.95 update provides powerful tools for organizing unstructured information.

Whereas other PIMs concentrate on calendars and contacts, Info Select focuses on free-form notes. When those notes begin to pile up, you can use Info Select's search engine to find exactly what you're looking for.

The program's main screen has two windows: a selector similar to File Manager and a workspace. Click on a note in the selector and its contents are displayed and can be edited in the workspace. Or you can scroll quickly



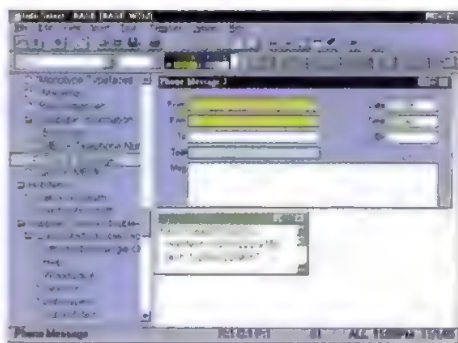
NO MISSING LINKS: CleanSweep 95 tells you which files use—and are used by—any DLL or .EXE file on your system.

price: \$29.95. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 95. Quarterdeck Corp.,

Marina del Rey, CA; 800-683-6696, 310-309-3700; fax, 813-532-4222. Circle 437 on reader service card

through an entire stack of notes using the arrow keys.

There are two methods for organizing notes. In the selector, you can "promote" or "demote" items by shifting them horizontally. Or you can place high-priority items in folders, which can be accessed quickly by clicking on a row of tabs below the toolbar.



STAYING IN TOUCH: In addition to the database for names and addresses, Info Select 3.0 handles phone messages.

There are built-in folders for pending items, calls to be made, and to-do lists; you can create your own as well.

Right-clicking on one of these tabs produces a pop-up menu that allows you to search the con-

tents of a folder quickly.

There are many shortcut keys, such as "G" for GOTO, which opens a dialog box for text searches. As you type, the program provides a graphic depiction of the number of matches. It's unusual but also very functional.

In addition to the free-form notes, Info Select provides templates for letters, memos, fax cover sheets, and even telephone messages. You can add a date and time stamp to any form.

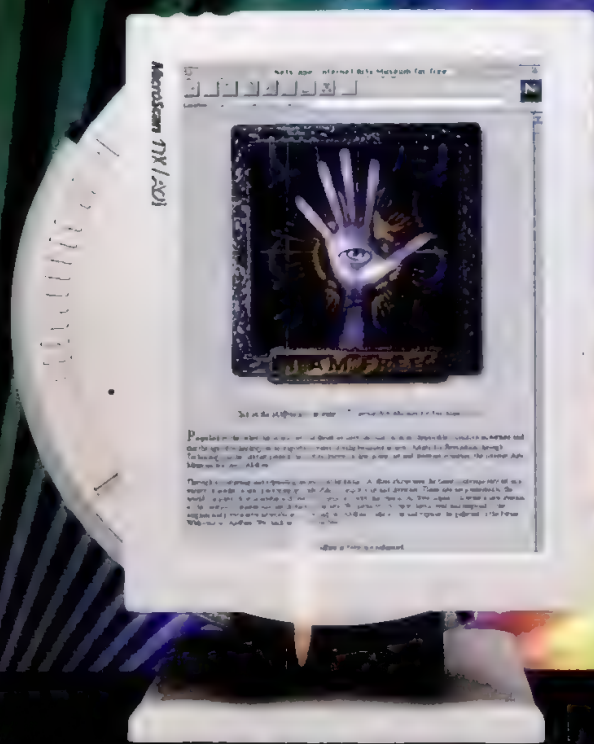
A new Calendar form, accessible from the selector, displays both monthly and daily schedules and lets you make appointments and set alarms. The program also includes a database for names and addresses and a phone dialer.

Despite these new features, the interface is not as polished as that of more structured PIMs such as Day-Timer Organizer or Sidekick.

Though it won't replace a full-featured PIM, Info Select 3.0 provides powerful and unique tools for those looking to organize bits of information.

Info Select 3.0 for Windows. List price: \$149.95; upgrades, \$69.95. Requires: 4MB RAM, 2MB hard disk space, Microsoft Windows 3.1 or Windows 95. Micro Logic Corp., Hackensack, NJ; 800-342-5930; fax, 201-342-0370.

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Surfing the Internet just took a turn for the better.

View Oversized Documents Without Scrolling

The ADI MicroScan™ 17X monitor puts a whole new spin on the way you work. In seconds, it can



switch from landscape to portrait without closing any running applications.

Just click on the portrait driver icon, turn the monitor, and hit the degauss button on the front-panel. It's that easy to flip between Internet home pages, word processors, oversized spreadsheets, and other applications—and still get the big picture.



Larger Viewing Area In Its Class

The MicroScan 17X is like getting a 21" display for the price of a 17" monitor. Its vertical viewing area in portrait mode is larger than any 17" or even 21" monitor on the market, and easily accommodates an entire 8.5" x 11", legal or A4 page in portrait view. No need to scroll or print to see the whole page. This means you'll be able to do twice as much in half the time.

High-Quality Feature Set

The MicroScan 17X also has many other things to flip over. Like a 17" CRT display with a 16" diagonal viewing area, 1024 x 768 resolution, flicker-free 76Hz performance, .28mm dot pitch, microprocessor digital controls, even Plug-n-Play compatibility. It's a feature set you won't find in competitively priced monitors. And since ADI builds monitors for leading PC companies worldwide, you know you're making a quality investment for the long haul. The MicroScan 17X is also backed by a three-year warranty. Best of all, you don't have to be a Web Master to get one. Just call 1-800-228-0530 for your nearest dealer.

ADI

Any way you look at it.

ADI Systems, Inc. 2115 Ringwood Avenue, San Jose, CA 95131

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CIRCLE 226 ON READER SERVICE CARD

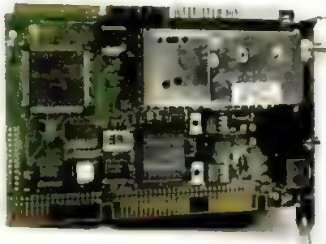
GRAPHICS

GrafixStar Integrates Graphics And Video: I Want My PCTV

By Jon Hill

VideoLogic's GrafixStar series of graphics accelerators and peripherals provides a one-stop integrated video-playback system for the PC with a variety of options. The 2MB versions of VideoLogic's new PCI-based 64-bit graphics cards we looked at (the \$189 GrafixStar 300, the \$199 GrafixStar 500, and the \$249 GrafixStar 700) offer a range of 64-bit multimedia accelerators for handling high-end graphics as well as video and television.

The GrafixStar's modular design lets you extend your PC's multimedia capabilities with VideoLogic's plug-in peripherals. We tested the three GrafixStar cards with the \$229 Captivator Pro TV and \$249 MPEG Player. These ISA-bus devices connect to the graphics card via a \$49 VESA Media Channel (VMC) Controller and a short ribbon cable.



from any S-Video, composite, or standard cable TV input. But clearly the main emphasis of these products is playback.

On our 100-MHz Pentium test-bed running Windows 3.11, we were able to capture a 320- by 240-pixel, 15,000-color video clip at 15 frames per second. The system dropped occasional frames even at these modest settings.

The GrafixStar cards were each equipped with 2MB of RAM and



WORK AND WATCH: The GrafixStar series can be combined with the Captivator Pro TV to bring television to the desktop PC.

provided adequate, but not outstanding, graphics performance. Their scores on our Graphics WinMark 96 benchmark tests were 11.3, 11.7, and 13.8 million pixels per second for the GrafixStar 300, 500, and 700 respectively at 1,024-by-768 resolution at 16-bit color depth. This puts the group roughly on a par with other midrange video cards.

Of the three, the GrafixStar 700 stands out because it uses

4MB of VRAM for higher resolutions and color depths.

GrafixStar 300. List price: \$189.
GrafixStar 500. List price: \$199.
GrafixStar 700. List price: \$249.
Captivator Pro TV. List price: \$229.
MPEG Player for VMC. List price: \$249.
VMC Controller. List price: \$49. Requires: Free PCI slot. VideoLogic Inc., San Bruno, CA; 800-578-5644, 415-875-0606; fax, 415-875-4167.

Circle 431 on reader service card

VIDEO

Panasonic Extends the CF41 Notebook with MPEG Video

By Brian Nadel

Not the type of company to sit still after engineering one of the most capable multimedia notebooks, Panasonic has added full-motion video to its CF41 MKII CD-ROM notebook. The \$649 MPEG video-decoding pack transforms the CF41 from a presentation system suited for displaying graphics and still photographs into one ready, willing, and able to play high-quality video.

The 0.9- by 4.3- by 5.7-inch CF-VEV411 Full-Motion Video Pack weighs just 10 ounces and slips into the CF41's modular hardware bay, which also can hold a second battery. The video pack works well with the system's built-in double-speed CD-ROM drive tucked beneath the CF41's keyboard.

With the MPEG module on-board, the CF41 can play back full-screen video from MPEG files or video CDs from the CD-ROM drive or the hard disk. The quality of the module's video playback

was on a par with that of IBM's ThinkPad 760 CD, except that the Full-Motion Video Pack was capable of decoding only MPEG-1



GO TO THE VIDEO: Panasonic's MPEG module for its CF41 notebook adds the ability to play back full-motion video.

video, not files in the more advanced MPEG-2 format. On the whole, playback was good with balanced color, though frames were dropped occasionally.

The two big disappointments, battery life and screen size, are as

much a function of the notebook as its MPEG module. Despite excellent power management, with the Full-Motion Video Pack in place, battery life for the nickel hydride cells dropped to less than an hour—hardly enough time for the first half of a movie on your next coast-to-coast flight. And at 10.4 inches, the active-matrix color display felt cramped, particularly when compared with the larger screens appearing on the newest notebooks.

With its optional CF-VEV411 Full-Motion Video Pack, the Panasonic CF41 continues to be the notebook-maker's model for integration of CD-ROM and video. But compared with the latest portable PCs, it feels heavy and bulky.

Panasonic CF-VEV411 Full-Motion Video Pack. List price: \$649. Requires: Panasonic CF41 MKII notebook. Panasonic Personal Computer Co., Secaucus, NJ; 800-662-3537, 201-271-3182; fax, 201-392-6618.

Circle 407 on reader service card

EASY INSTALLATION

We were able to use the Captivator Pro TV and MPEG Player add-on cards interchangeably with the three GrafixStar cards as well as VideoLogic's 928Movie and PCIMovie cards. Setup of all the cards and accessories under Windows 95 was a breeze. VideoLogic supplies Windows 95 drivers for the entire GrafixStar series that let you control advanced settings from Windows 95's Display Properties dialog box. There's also a suite of utilities, including a Direct Draw tool for resizing video windows of third-party software that would otherwise be restricted to a fixed resolution.

The Captivator Pro TV is a video-capture card with a built-in TV tuner that puts a television window on your PC's screen. It comes equipped with an MCI digital-video driver; a Video for Windows capture driver; a Video Control Panel that lets you customize settings such as brightness, contrast, gamma correction, hue, and saturation; and TV Snap, which lets you capture frames

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MULTIMEDIA UPGRADES

Multimedia to Go: CD-ROM Add-Ons

By Bruce Brown

Portable computers are hot and so is multimedia, but not all notebooks come ready to spin CD-ROM disks and play sound. Yet adding CD-ROM capability and sound has become a lot easier, thanks to new PC Card-based peripherals.

We used a Dell Latitude P90T notebook to test the Altec Lansing AMC2000, the EXP CD-421, the Panasonic KXL-D721, and Zenith Data Systems' Z-Player.

Altec Lansing's \$670 AMC2000 Portable CD ROM Multimedia Center was the largest unit of the four we looked at, but it also produced the best sound. A Type II PC Card connects the 2.1- by 11.8- by 9-inch, 6-pound-5-ounce AMC2000 to your notebook.

The AMC2000's double-speed CD-ROM drive produced average performance but was far more capable than our comparison drive, MicroSolutions' Backpack. The AMC2000 is limited to AC operation. The unit includes controls for volume and tone.

FOUR FOR THE ROAD

This quartet of multimedia add-ons provides a variety of ways to extend a notebook's abilities. Clockwise from top: the Panasonic KXL-D721, the EXP CD-421, ZDS's Z-Player, and the Altec Lansing AMC2000.



EXP Computer's \$425 CD-421 Quad-Speed PCMCIA CD-ROM Kit is a mixed bag: It is the only quad-speed unit of the four, but it is also the only one without a sound card. The CD-421 uses a Type I PC Card rather than the thicker Type

II card. Access time and throughput were the best of the bunch. At 1.9 by 6.4 by 9.7 inches, it is about the size of an external CD drive and weighs 3 pounds 14 ounces.

combine the CD-421's CD unit with the AMC2000's sound in a package the size of the KXL-D721, with the Z-Player's price. **Altec Lansing AMC2000 Por-**

BENCHMARK TESTS

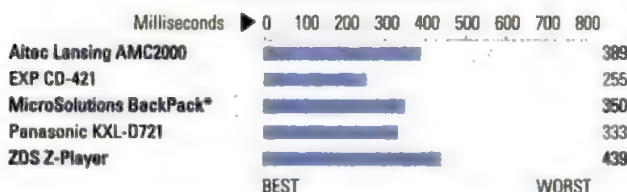


Multimedia Add-Ons

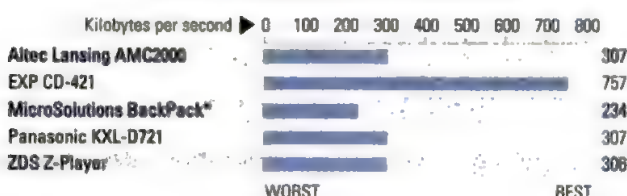
In terms of raw CD-ROM performance, the leader of this group was clearly the EXP CD-421, the only quad-speed unit of the four tested systems. The units with double-speed drives had roughly equivalent data throughput, but the Panasonic KXL-D720 led with the fastest access time.

To gauge the performance of these multimedia add-ons, we used PC Magazine Labs' WinBench 96. We tested each add-on using a Dell Latitude P90T notebook with 8MB of RAM and 256K of external cache.

CD-ROM ACCESS TIME



CD-ROM SEQUENTIAL 10K READ



* Reported for comparison.

Tops in performance but the quiet one of the bunch, EXP Computer's CD-421 is perfect for a notebook in search of a CD.

Panasonic Communications and Systems Co. sells the KXL-D721 two ways: as a complete \$599 package or as the \$399 PCMCIA CD-ROM Player and the snap-on KXL-D20 Multimedia Sound Kit, which adds audio (\$349).

At 2 pounds 2 ounces and 1.2 by 5.3 by 7.9 inches, the KXL-D720 resembles a portable audio CD player and can run on batteries or AC power. The double-speed CD-ROM drive attaches via a Type II PC Card and had the best data-access times of the double-speed drives. The KXL-D20 is Sound Blaster- and Ad Lib-compatible, but the included small speakers produced disappointing sound quality.

The \$499 Z-Player was the first notebook multimedia add-on system. It remains the least expensive and smallest all-in-one CD-ROM and audio system. The 3-pound-10-ounce, 1.5- by 10.5- by 7.7-inch Z-Player connects via a Type II PC Card and is the only one that installs its software from Windows.

None of these four CD-ROM add-ons are perfect. An amalgam of the best features of each would

table CD ROM Multimedia Center. List price: \$670. Requires: 4MB RAM, 1MB hard disk space, Type II PC Card slot, Microsoft Windows 3.1 or later, DOS 6.0 or later. Altec Lansing Technologies, Milford, PA; 800-648-6663, 717-296-2818; fax, 717-296-1222.

Circle 438 on reader service card

EXP CD-421 Quad-Speed PCMCIA CD-ROM Kit. List price: \$425. Requires: 4MB RAM, 1MB hard disk space, Type I PC Card slot, Microsoft Windows 3.1 or later, Windows 95, DOS 5.0 or later. EXP Computer Inc., Irvine, CA; 800-397-6922, 714-453-1020; fax, 714-453-1319.

Circle 439 on reader service card

Panasonic KXL-D721. List price: \$599. Requires: 4MB RAM, 4MB hard disk space, Type II PC Card slot, Microsoft Windows 3.1 or later, Windows 95, DOS 5.0 or later. Panasonic Communications and Systems Co., Secaucus, NJ; 800-742-8086, 201-348-7000.

Circle 440 on reader service card

Z-Player. List price: \$499. Requires: 4MB RAM, 4MB hard disk space, Type II PC Card slot, Microsoft Windows 3.1 or later, DOS 6.0 or later. Zenith Data Systems, Buffalo Grove, IL; 800-533-0331, 708-808-5000; fax, 800-472-7211, 708-808-4434.

Circle 540 on reader service card

Quarterdeck CleanSweep™ 95 is the first 32-bit uninstaller for all versions of Windows. We also believe it's the only uninstaller worth looking at, period. But you don't have to take our word for it.

"When you delete files, CleanSweep bundles them into a package, compresses them, and archives them where it can find them again... this looks to be... one of the 'must have' Windows '95 supplementary programs."

JERRY POURNELLE, BYTE, NOV 95 "CleanSweep 95's user interface is still the simplest and most intuitive of all the commercial uninstallers PC Week Labs has seen... CleanSweep's system cleanup features were very strong, helping us find duplicated, unused, and orphaned files to remove from our systems."

JIM RAPOZA, PC WEEK, NOV 95 "To the rescue comes Quarterdeck's new CleanSweep.

When I installed CleanSweep, I had a spindly 5MB left on my 340MB hard disk's C: partition. As I write this I have 33MB. CleanSweep 95... is the janitor who can get you back that accidentally tossed manila folder the next day. It gives you a new lease on disk space with a vow never to let you junk your drive up again."

PAUL ANDREWS, SEATTLE TIMES, OCT 95



DIGITIZING TABLETS

Artless Windows 95 Drivers Hamper Promising Wacom ArtZII and Pen

By Lance Ulanoff

Wacom has always been one of the smarter and swifter players in the digitizing-tablet market. It was among the first to cut the umbilical cord-like cable between the tablet and the pen, and it then removed the battery from the pen. Its latest step forward is to put an "eraser" on the end of its UltraPen and add a long-requested programmable menu strip to the top of its 6- by 8-inch, \$389.99 ArtZII Graphic Pad with Erasing Ultra Pen. More smooth sailing, right? Not exactly. Apparently Microsoft Windows 95 has marred Wacom's otherwise stellar reputation for delivering complete products.

The system's Version 2.0 driver, which came as part of the shipping product, wouldn't install properly under Windows 95, although a Windows 3.1 installation went without a hitch. Wacom's technical-support staff had to help us to get Windows 95 and the tablet to cooperate. Subsequent beta revisions fixed the problem, but some frustrating problems remain.

When set to context-sensitive mode in the tablet's Control Panel, the top of the 9-millimeter-thick UltraPen, which weighs a third of an ounce, doubles as an eraser—at least in theory. It is essentially a pressure-sensitive button that works fine in most applications that can recognize it; you can use it to delete text and graphics with a few strokes.

Under Microsoft Word for Windows 6.0a, the cursor—which takes on a small eraser icon attached to it—flickers and will momentarily disappear when you move it across the screen. Although the flicker doesn't appear under Windows 3.1, we could neither select text by using the writing end of the pen nor set the Control Panel to "Context Aware."

The bright spot on our tests was that the tablet's programmable menu strip works perfectly under Windows 3.1. Of the 16 purple

buttons at the top of the tablet, 11 are preprogrammed function buttons, including cut, copy, paste, and pressure adjustments; 5 others are user-programmable.

Windows 95 functionality, though, is a mixed bag. When we tried to program button 1 for a backspace keystroke, the Control Panel recorded the stroke but wouldn't program the button, instead giving us the error message, "Function not implemented in driver."

Wacom's UltraPen is also the first in the industry to recognize the tilt of the pen. The pen can detect up to a 60-degree tilt, as well

as up to 256 levels of pressure, an addition that can be useful in calligraphic applications. At present, however, this feature works only under Fractal Design's Painter for Windows.

On the whole, the ArtZII tablet is a big step forward—perhaps too big. Wacom is aware of many of these driver problems and is in the process of correcting them. In fact, it may have done so by the time you read this.

With more stable drivers, this tablet stands to be the digitizer of choice for average desktop users looking for a more intuitive input. Still, we suggest visiting Wacom's CompuServe forum and/or its World-Wide Web site for a status



SCRATCH THAT: Wacom's ArtZII tablet includes a wireless UltraPen whose top mimics an eraser.

check on the company's progress before spending time or money on this otherwise promising tool. **ArtZII Graphic Pad with Erasing UltraPen.** List price: \$389.99. Requires: 100K RAM, Microsoft Windows 3.1 or later. Wacom Technology Corp., Vancouver, WA; 800-922-6613, 360-750-8882; fax, 360-750-8924; Web, <http://www.wacom.com>.

Circle 403 on reader service card

WINDOWS 95 UTILITIES

Drag And View: Quick View on Steroids

By J.W. Olsen

At first glance, Canyon Software's \$35 Drag And View for Windows 95 needlessly seems to duplicate Quick View, the useful document-viewer applet that's included in Windows

have is its broad range of supported file types.

You invoke Drag And View by right-clicking on one or more files in Explorer or a folder window and then selecting the appropriate menu choice. Or, after

also supports more than a dozen graphics formats as well as Adobe Acrobat, PowerPoint, .WAV, and ASCII formats. As a bonus, Drag And View—unlike Quick View—displays internal directories of popular archives such as .ZIP files.

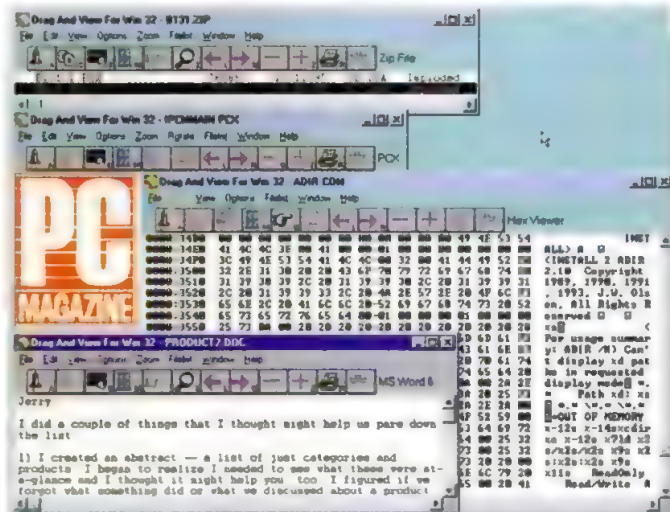
The treatment of executables is where Drag And View most obviously differs from Quick View. Drag And View provides a character-by-character hexadecimal display, while Quick View provides file-header data. Each format is helpful.

Drag And View offers additional features lacking in Quick View: versatile zoom; find and GOTO commands in text, databases, and spreadsheets; word wrap; and the ability to convert and save graphics in six different formats. On informal tests, Quick View occasionally provided slightly more faithful approximations of some formatting details.

With all this going for it, Drag And View belongs on your hard disk.

Drag And View for Windows 95. List price: \$35. Requires: 8MB RAM, 4MB hard disk space, Microsoft Windows 95. Canyon Software, San Rafael, CA; 800-280-3691, 415-453-9779; fax, 415-453-6195.

Circle 404 on reader service card

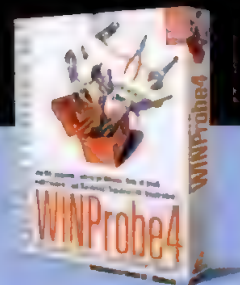


PICK YOUR POISON: Drag And View displays virtually any type of file on your system, including more than a dozen graphics formats.

95. Both display a reasonable approximation of file contents without invoking (or even having) the associated applications. But what makes Drag And View a must-

either program is active, you can drag files into its window.

Drag And View supports most major word processor, database, and spreadsheet formats. But it



Nothing gets by WinProbe™. That's what makes it the most powerful and comprehensive troubleshooter toolbox for both Windows® and Windows 95.

If there's a problem hidden in your system, WinProbe will let you know while there's still time to do something about it. If there isn't a problem, 300 or so tune-up suggestions will help you keep it that way. It does everything a technician would do – except send you a bill.

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AND YOUR FLYING
TOASTER SCREEN SAVER
IS GETTING A LITTLE
MONOTONOUS.**

automatically defragmenting your Windows and Windows 95 memory. And all the while it keeps you informed on a real-time status panel like the one above.

Your part is easy. Because WinProbe works within Windows 95 and Windows 3.1, there's none of that popping in and out of DOS that seems to be such a popular theme among other troubleshooters. You get to work in a familiar environ-

ment, using the powerful features of Windows.

To find out more, see your retailer, visit our website at www.qdeck.com, or give us a call at 1-800-683-6696. And do something about that paisley mousepad will you?

PROJECT MANAGEMENT SOFTWARE

SureTrak 1.5: Easier Project Management for the Masses

By Nelson King

Primavera's \$299 SureTrak Project Manager for Windows 1.5 has a multitude of enhanced features that make it easier to keep tabs on complex projects.

Primavera markets SureTrak 1.5 as a low-end project management package for those who need to monitor progress on projects involving hundreds of tasks.

This is especially true of multiple project management and activity codes, which were available in the previous version but now feature their own wizards and other enhancements.

The new Project Group Wizard makes it easier to keep track of many projects at once. Projects can be planned and controlled individually on a day-to-day basis or linked together in a project group for reports. A separate feature, which uses a check-in/check-out metaphor, allows users to take a "subproject" on the road, update it, and then reintegrate it into the master project.

For years, professional project managers have organized projects by assigning codes to tasks or activities. These activity codes allow users to slice and dice the data, but they've never been easy to set up.

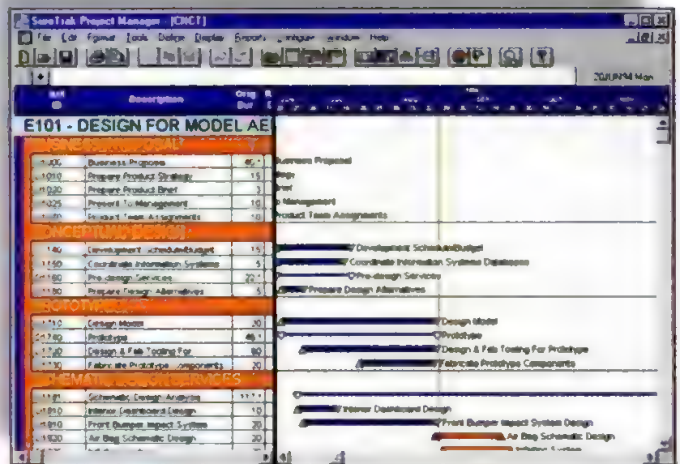
That's where the new SureTrak Activity Codes Wizard comes in. The wizard allows you to select from industry-specific templates and assign codes that sort projects by phase or persons responsible, for example.

Unfortunately, you need to do considerable research in the manuals and preparation on paper before you're ready to use the feature, and you almost need a wizard to coach you on how to use the Activity Code Wizard.

The list of other enhancements neatly covers the current hot topics in project management software. There are e-mail connections (VIM and MAPI) to communicate with project members, collect project data, and (in this version) broadcast several messages simultaneously. Sure-

Trak 1.5 is OLE-compatible and includes the ODBC drivers for its Btrieve file system, which allows users to export data to a variety of report generators and databases. Finally, at the click of a button SureTrak 1.5 can change its user interface to display text in 22 different languages.

New features and usability enhancements not only make this a major upgrade for the current user but also make SureTrak 1.5 a competitive choice for first-time buyers of project management software. SureTrak 1.5 could pose a major challenge to market leader Microsoft Project as the leading low-



PROJECT PARTNER: In SureTrak 1.5, multiple projects can be viewed by phase or other criteria based on assigned activity codes.

end project manager.

SureTrak Project Manager for Windows 1.5. Estimated street price: \$299; upgrade, \$99. Requires: 4MB RAM, 15MB hard

disk space, Microsoft Windows 95, Windows NT, or Windows 3.x. Primavera Systems Inc., Bala Cynwyd, PA; 800-423-0245.

Circle 402 on reader service card

GRAPHING SOFTWARE

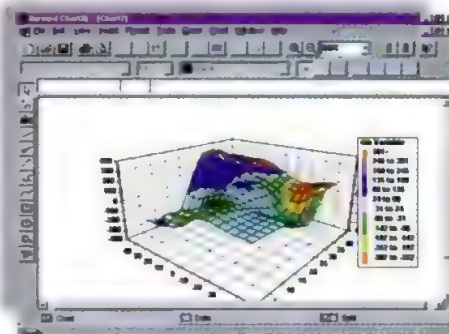
New Harvard ChartXL Provides More Graph Types and OLE 2.0 Support

By Craig Stinson

Software Publishing Corp.'s \$149 Harvard ChartXL 2.0 for Windows transforms numerical data into professional-looking graphs.

The program offers 300 preformatted chart types, organized into three categories: business, statistical, and technical. The business branch includes two- and three-dimensional bubble and pyramid charts, as well as the conventional pies, bars, and lines. The statistical set offers box-whisker charts, star plots, histograms and paretos, scatter charts, and an assortment of error bars. The technical component handles polar charts, Smith charts, vector charts, surface charts, and contour charts. In addition, a "formula visualizer" lets you enter algebraic functions and turn those formulas directly into various kinds of charts.

ChartXL can now crunch your numbers as well as plot them. ChartXL includes its own multi-sheet spreadsheet component, which mimics Microsoft Excel. If you ask for automatic processing, the program displays the results on as many new spreadsheet



ADJUSTO-MATIC: Harvard ChartXL lets you change chart labels and colors on the fly.

pages as are required.

ChartXL offers the expected formatting amenities and lets you assign colors to value ranges on charts. The program also provides a full set of drawing tools; the ability to implant text anywhere and rotate it to fit alongside data

markers; a command to simplify the entry of symbols, Greek letters, subscripts, and so on; and axis labels that can be slanted, staggered, or skipped.

ChartXL's toolbar provides direct access to many analytical functions. Other new features include a graph-preview mode and a split-screen option that allows you to view a graph and its data simultaneously. ChartXL is now an OLE 2.0 server and container; you can import (and link with) Excel 5.0 .XLS data. But the .XLS import gets only the first worksheet in a multisheet file, and Lotus's .WK4 format is still not supported.

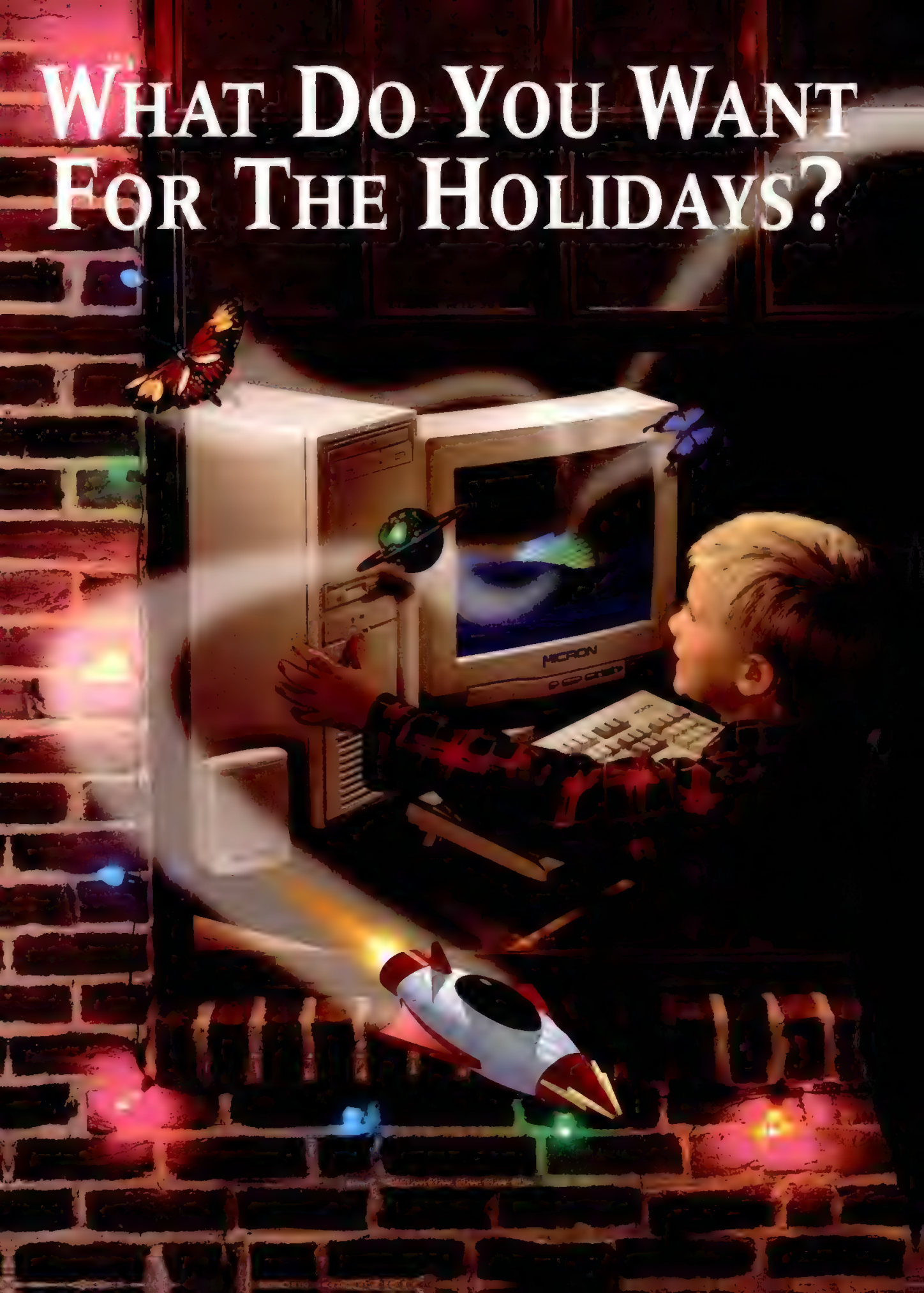
With large data sets, we found ChartXL extremely slow on the draw (taking 22 seconds, for example, to draw a graph that Excel spits out in 3). More seriously, ChartXL improperly ignores N/A values rather than leaving gaps in the resulting chart.

When used with care, Harvard ChartXL is a superb accessory to your spreadsheet program.

Harvard ChartXL 2.0 for Windows. Estimated street price: \$149. Requires: 8MB RAM, 5MB hard disk space, Microsoft Windows 95, Windows NT, or Windows 3.x. Software Publishing Corp., Santa Clara, CA; 800-336-8360; Web, <http://www.spc.com>.

Circle 401 on reader service card

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WORKSTATIONS

Affordable workstation performance is now a reality. New from Micron—the Pro200 Magnum Plus workstation is the most advanced system available today. It combines exceptional Micron engineering with Intel's advanced Pentium® Pro processor, and Windows® NT. The result is the fastest, most reliable system on the market. Where else would you expect to find this kind of quality and engineering except from Micron—the technology leader.



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Intel 200MHz Pentium Pro processor
 1MB internal cache, flash BIOS
 32-bit Ultra SCSI Fast-20 controller
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 SoundBlaster™ 16 stereo sound & speakers
 4-bit video, MPEG, 2MB EDO
 Free mini-tower or desktop
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16MB RAM • 2GB Fast SCSI-2 hard drive
 17" Micron 15FGx, 1280NI, .28mm monitor

\$599 Business lease \$183/month

32MB RAM • 4GB Fast SCSI-2 hard drive
 17" Micron 17FGx, 1280NI, .26mm monitor

\$1,399 Business lease \$274/month

64MB RAM • 9GB Fast SCSI-2 hard drive
 21" Micron 21FGx, 1600NI, .28mm monitor

\$2,299 Business lease \$395/month



THE BEST PC M

"The Millennium is nothing short of the best all-around PC available on the market today."

PC Magazine, April 25, 1995

With 133MHz of screaming Pentium processor horsepower, Micron's P133 Millennium races far ahead of all established benchmarks into a whole new universe of unbridled computing performance. And with new memory technologies like EDO memory and pipelined burst cache, this proven champion is optimized to perfection. The P133 Millennium is ready to run any application you want. Right now! There's no stopping the Micron Millennium. So what's stopping you?



MONEY CAN BUY

P133 MILLENNIA

- Intel 133MHz Pentium processor
- 256K pipelined burst cache, flash BIOS
- 4X EIDE CD-ROM drive, 3.5" floppy drive
- SoundBlaster 16 stereo sound & speakers
- PCI 64-bit video, MPEG, 2MB EDO
- Tool-free mini-tower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 CD

- A** • 8MB EDO RAM • 850MB EIDE hard drive
 • 15" Micron 15FGx, 1280NI, .28mm monitor
 • Microsoft Works 95 CD

\$2,399 Business lease \$86/month

- B** • 16MB EDO RAM • 1.2GB EIDE hard drive
 • 15" Micron 15FGx, 1280NI, .28mm monitor
 • Microsoft Office Pro 95 & Bookshelf 95 CDs

\$2,899 Business lease \$103/month

- C** • 32MB EDO RAM • 1.6GB EIDE hard drive
 • 17" Micron 17FGx, 1280NI, .26mm monitor
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\$3,899 Business lease \$133/month

- With 120MHz Pentium processor.....subtract **\$100**
- With 100MHz Pentium processor.....subtract **\$200**

P133 MILLENNIA PLUS

- Intel 133MHz Pentium processor
- 256K pipelined burst cache, flash BIOS
- PCI 32-bit Ultra SCSI Fast-20 controller
- 6X SCSI-2 CD-ROM drive, 3.5" floppy drive
- SoundBlaster 16 stereo sound & speakers
- PCI 64-bit video, MPEG, 2MB EDO
- Tool-free mini-tower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 CD
- Microsoft Office Pro 95 & Bookshelf 95 CDs

- A** • 16MB EDO RAM • 1GB Fast SCSI-2 hard drive
 • 15" Micron 15FGx, 1280NI, .28mm monitor

\$3,299 Business lease \$112/month

- B** • 32MB EDO RAM • 2GB Fast SCSI-2 hard drive
 • 15" Micron 15FGx, 1280NI, .28mm monitor

\$4,299 Business lease \$147/month

- C** • 64MB EDO RAM • 4GB Fast SCSI-2 hard drive
 • 17" Micron 17FGx, 1280NI, .26mm monitor

\$6,299 Business lease \$206/month



Exceptional speed, performance and reliability are just a few of the reasons why Micron is a technology leader in PC design. From the powerful and award-winning PowerStation, to the P266 PowerServer SMP, Micron offers a complete range of dependable products to suit every need. So when you're considering your next PC purchase, consider how much you'll get in a Micron PC.

P100 POWERSTATION

- Intel 100MHz Pentium processor
- 256K write-back cache, flash BIOS
- 4X EIDE CD-ROM drive, 3.5" floppy drive
- SoundBlaster 16 stereo sound & speakers
- PCI 64-bit video, MPEG, 2MB EDO
- Tool-free mini-tower or desktop
- Microsoft Mouse, 104-key keyboard
- Microsoft Windows 95 CD

- A** • 8MB EDO RAM • 850MB EIDE hard drive
 • 15" Micron 15FGx, 1280NI, .28mm monitor
 • Microsoft Works 95 CD

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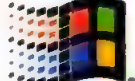
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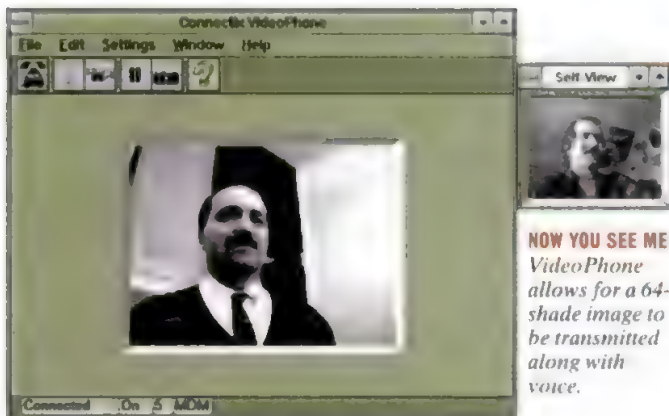
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First Looks



VIDEOCONFERENCING

Connectix VideoPhone: Conferencing on the Cheap

By Alfred Poor

Many of us grew up anticipating when we could have cool communications toys, such as two-way wrist televisions. Videoconferencing comes close to this dream, but at \$1,000 and up a seat, it remains a dream for most of us. Connectix's combination of its camera, QuickCam, and conferencing software, VideoPhone for Windows, provides all you'll need for a voice-and-video conversation for about \$150 per seat. Though there are many compromises, such as the lack of color, low frame rate, and poor image quality, VideoPhone will likely go where no conferencing product has gone before.

The key is that VideoPhone makes good use of your PC's components. The hardware in the system is simply the digital camera, QuickCam, although you can use the software with other video sources. The package relies on your computer's existing sound card (and speakers and microphone) and its existing communications connection: LAN, direct serial link, or ISDN modem.

TEE TIME

The QuickCam is a gray plastic sphere with a diameter of 1.8 inches that looks either like an eyeball or a golf ball. Behind its small window is a CCD (charge-coupled device) image sensor that is capable of 320- by 240-pixel resolution. The camera can handle

up to six bits of gray-scale data for a total of 64 shades; you can set the system to four-bit mode to produce 16 shades of gray to reduce the amount of data per image. QuickCam has a fixed-focus lens that works well for objects as close as 18 inches and is relatively wide-angle—equivalent to about a 38-millimeter lens on a 35-mm photographic camera.

Hardware installation is about as easy as it gets. The multiheaded cable plugs into a parallel port to transmit data and the keyboard port to draw power; the PC's keyboard plugs into the remaining connector. There is no parallel-port pass-through, so if you have a printer and want to keep the camera installed permanently, you may want to add an extra parallel port.

There are many configuration choices that you can make, including the levels of gray to use in the image, the desired frame rate, the kind of connection to use, the image resolution, and the level of real-time compression. The software has automatic exposure controls, but on our tests we found that you can generally improve the image quality by manually adjusting the settings—especially under less-than-optimal lighting conditions.

The Windows-based software also includes videoconferencing and shared whiteboard applications for long-distance collabora-

tion. There are also QuickCam utilities that let you capture still images and video clips.

You can set the program to notify you when someone is calling to establish a conference so that you can choose to accept or reject the connection. You can also set the system up to accept connections automatically. This works well for an unattended system that you can then use to monitor a remote location visually.

When a conference is established, you can also open a self-view window to monitor the image that you are sending. For ISDN and direct serial connections, you can only have two participants. Using a TCP/IP or NetWare LAN connection, you can have multiple participants. Connectix expects to add multipoint and cross-platform support for the Windows product soon.

The Windows version supports a broadcasting feature in which one station on the network can send out an image that can be received by many stations, but the stations can't reply. The receiving stations can use ei-

voice portion works better. Few PCs support full-duplex connections, so using the tried-and-true telephone will probably be much more satisfying and productive.

BODY LANGUAGE

We tested the system with an ISDN hookup and transmitted 16-level gray-scale images. Generally, they were clear enough so that we could recognize each other and pick up some body language, such as facial expressions and slow gestures. Depending on the image size and other settings, we observed frame rates of about 2 frames per second or less, making the conference appear as if it were being filmed by a surveillance camera in a bank.

One of our videoconferencing sites was lit with fluorescent lamps, resulting in distracting fluctuations in the light levels of the transmitted images. We solved this by going into VideoPhone's software to adjust the light level, which altered the camera's shutter speed and eliminated the flickering.

In the end, the question remains whether this rudimentary level of video is worth the effort and cost. If it weren't for the incredibly low cost of this unit, the answer might be thumbs down. Instead, for about one-tenth the cost of other videoconferencing systems, you get a simple system with low frame rates that is sufficient to augment a remote conversation.

VideoPhone makes the most sense where the connection is inexpensive—such as a local phone call or across a LAN—but the wide range of configuration choices lets you choose your own level of trade-off between image quality and frame rate.

And when Connectix brings out the color version of VideoPhone later this year, it will be even more appealing.

Connectix VideoPhone for Windows. Estimated street price: \$150. Requires: 8MB RAM, Microsoft Windows 3.1 or later, sound card, parallel port. Connectix Corp., San Mateo, CA; 800-950-5880, 415-571-5100; e-mail, cvp@connectix.com.

Circle 410 on reader service card



EYES HAVE IT: Looking like a large eyeball, the QuickCam digital camera provides the basis for a low-cost conference.

ther VideoPhone or a special no-cost program available from Connectix.

You can use VideoPhone's built-in voice-conferencing abilities along with your system's sound card, microphone, and speakers, but we found that making a separate phone call for the

DATA SECURITY

Scrambler for Windows Makes It Easy to Keep a Secret

By Jay Munro

Keeping your data and messages private in an increasingly transparent digital world is becoming an important aspect of daily life. If you wouldn't put sensitive information on a postcard, then it shouldn't travel through cyberspace in readable form. Scrambler Technologies' \$69.95 Scrambler for Windows combines the latest in encryption technology with an understandable interface to give you an easy way to keep a secret.

Scrambler uses 56-bit DES (Data Encryption Standard) algorithms for the U.S. and Canadian version and a similar, 40-bit block-cipher algorithm version for international use. The program installed easily, requiring a user name and a password of up to 24 digits, which Scrambler calls a Keyword. Scrambler lets you encrypt everything from CAD drawings to audio files to word processing documents to graphics, either individually or in batch mode.

To work, the Scrambler system requires that both sender and receiver have a copy of the product. And unlike with public-key systems, you both need to know the unique—and presumably secret—Keyword that was used to encrypt the file or message.

File encryption starts with specifying the files to protect as well as your Keyword. Scrambler replaces the original file with the scrambled one rather than producing an encrypted copy alongside the original. Though inherently more secure, this does leave you high and dry if you forget your Keyword.

To scramble all or part of a document, start Scrambler before you run your e-mail or word processing program. Once Scrambler is running, highlight the text you want to encrypt and select Scrambler from the control menu. Pushing the Scramble button brings up the Keyword dialog box. To encrypt the text, just push the Scramble button and enter the

Keyword, as well as a confirmation Keyword. Once the text is encrypted, nothing other than the original Keyword will decrypt it.

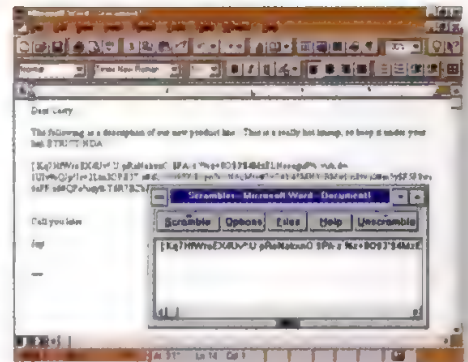
The text in the Clipboard is now gobbledygook. Scrambler then sends the encrypted text back to the original document, replacing the selected text. At the other end, to resurrect the encrypted prose, select the scrambled text and press the Unscramble button. Enter the Keyword, and the text becomes readable.

Because of current technology-export restrictions, the U.S. and

Canadian version is not licensed for sale outside of North America, which requires your international offices to use the less secure export version. For compatibility, the U.S. and Canadian version will also encrypt in the less secure export format.

Scrambler for Windows has an easy-to-use interface targeted at all user levels and provides a reasonable level of security for all sorts of files and electronic documents.

Scrambler for Windows. List price: \$69.95. Requires: 4MB



HIDE IT: Scrambler allows up to 56-bit data encryption for use in the U.S.

RAM, 500K hard disk space, Microsoft Windows 3.1 or later. Scrambler Technologies Inc., Loveland, CO; 800-834-4005, 970-346-4066; fax, 970-346-4003. Circle 408 on reader service card

CD-ROMs

Need to Know? Look It Up in Compton's Reference Collection

By Bruce Brown

Compton's Reference Collection 1996 Edition sells for \$60 but includes impressive reference tools, making it suitable for both home and office use.

Divided into two general sections, the Desk Reference Center and the Business Center, Compton's Reference Collection uses a

browse by reference source, use a time line of world history, or search based on geography.

The centerpiece of the Desk Reference Center is *Compton's Concise Encyclopedia*, covering 25 volumes of text with 8,000 pictures, 75 video clips, and more than 15 hours of sound clips, in addition to a world atlas, a dictionary, and a thesaurus. For quick

Dictionary of Quotations comes with more than 20,000 quotations. Anyone who writes for a living, for grades, or for the proper effect will benefit from the included electronic version of Strunk and White's *The Elements of Style*.

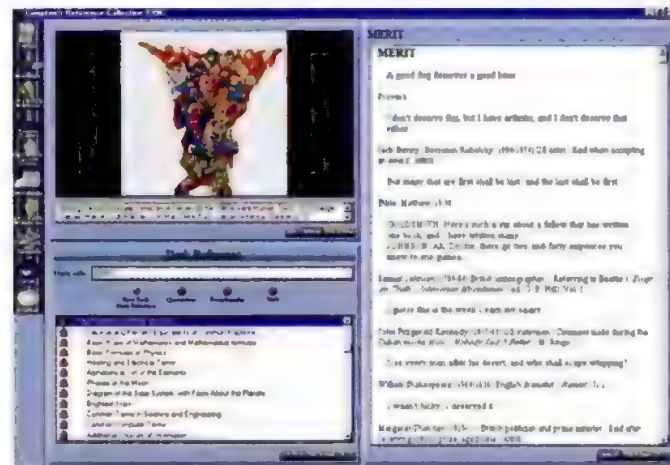
The Business Center includes *J.K. Lasser's Legal and Corporation Forms for the Smaller Business*, with more than 200 forms and contracts, and *Resumes for Better Jobs*, which has general job-hunting tips in addition to almost 300 position-specific résumé samples. *The Office Guide to Business Letters, Memos & Reports* has more than 50 sample letters as well as templates for letters, forms, and reports. *The Elements of Business Writing* lists rules for business communication.

A welcome bonus is Pro Phone's Home Phone Lite, a two-CD set of 72 million U.S. residential telephone listings.

Compton's Reference Collection is a nearly bottomless pit of information for work, study, and entertainment.

Compton's Reference Collection 1996 Edition. Estimated street price: \$60. Requires: 4MB RAM (8MB recommended), 10MB hard disk space, CD-ROM drive, Microsoft Windows 3.1 or later, MSCDEX 2.2 or later. Compton's NewMedia Inc., Carlsbad, CA; 800-261-6109, 619-929-2500; fax, 619-925-2577.

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IT'S ALL THERE: Compton's Reference Collection combines business and general-purpose reference sources, including many multimedia selections.

variety of search tools to help you find the right information. You can choose to follow a topic tree,

information, *The New York Public Library Desk Reference* is a good start, and *The Macmillan*

SCANNERS

Super Coolscan: Rugged Film Scanner For Images on the Go

By Daniel Grotta and Sally Wiener Grotta

The \$2,695 Nikon Super Coolscan LS-1000, a color film scanner, uses an LED instead of the more customary fluorescent tube to illuminate negatives or transparencies for greater ruggedness and reliability as well as sharper scans. Capable of resolutions up to 2,700 dots per inch (dpi) and 12 bits of color information per color channel, the Super Coolscan can theoretically produce high-quality 28.8MB image files. But the unit has some annoying limitations: It is slow, and at this time can produce images only up to 16MB.

At 2.5 by 6.1 by 10.6 inches and a weight of 4 pounds, the Super Coolscan is heavier and bulkier than its predecessor, the Coolscan LS-10. Though it is too large to fit into a PC's drive bay, the Super Coolscan is still small and light enough to put into a bag. The reason for the extra weight and size is to accommodate the unit's auto-focus circuitry. Instead of toying with the imprecise manual focus knob on the original, you simply click the Super Coolscan's auto-focus icon. You can still manually focus the system for warped slides or to introduce a blurry look.

According to Nikon, the Super Coolscan can scan a 35-millimeter slide at 2,700 dpi in under 40 seconds, which is much faster than the Coolscan LS-10's 15-minute scan time. But scanning at that speed and resolution isn't possible with current software and would require a PC with at least 57MB of RAM. With less memory, the scanner downshifts to use much less efficient virtual memory, which slows the process greatly.

Using Nikon's Twain driver in Micrografx Picture Publisher 6.0, we scanned part of a 35-mm slide at 2,000 dpi to produce a 15MB image file. In the bilinear interpolation mode, it took our 100-MHz

Pentium test-bed with 32MB of RAM 3 minutes 34 seconds to produce the scan. Without bilinear interpolation, the less detailed scan took 1 minute 12 seconds.

In addition to not being able to save images within the standalone Twain driver, the current driver does not support Adobe Photoshop 3.0. Nikon is aware of the problems and promises to update the driver early this year.

Despite driver snags, we were very impressed with the unit's output quality. Nikon's optics are first-rate and the resulting images were well defined, with realistic colors and negligible artifacts and noise. The optional \$685 snap-on Auto Slide Feeder is simple to set up and allows for unattended scanning of up to 70 slides.



SCANS TO GO: Based on LEDs, the Super Coolscan is rugged and light enough to take on the road. The Super Coolscan produces high-quality 24-bit images that are about 15MB.

In addition to the Twain-compliant driver, the Super Coolscan LS-1000 comes with Nikon Control 2.0, which can be used as a standalone module for single scans or for controlling and archiving unattended batch scans.

We expect that eventually the Super Coolscan will replace the Coolscan LS-10 as the best-selling film scanner. For the time being, however, the slower Coolscan LS-

10, which sells for about \$850 less, remains the film scanner of choice.

Super Coolscan LS-1000. List price: \$2,695. Requires: 8MB RAM, 1MB hard disk space, VGA graphics board (24-bit recommended), DOS 5.0 or later, Microsoft Windows 3.1 or later. Nikon Electronic Imaging, Melville, NY; 800-526-4566, 516-547-4355.

Circle 541 on reader service card

DIGITAL PHOTOGRAPHY

Kodak Photo Insert: The Easy Way to Add Color to Documents

By Melissa J. Perenson

As the saying goes, a picture is worth a thousand words, and Kodak Digital Science Photo Insert software could be just the tool for adding color images to word processing documents.

Photo Insert is a free utility that now comes bundled with Photo CD.

Photo CD has yet to meet with success in the consumer market, and Photo Insert is part of Kodak's two-pronged effort to change that. Eastman Kodak has also decreased the cost of Photo CD services for transferring film images to digital format.

The idea behind Photo Insert is to make it simple to create smart-looking documents with

any OLE 2.0-compatible word processor for Windows 3.1, including Microsoft Word 6.0, Microsoft Works 3.0, or WordPerfect 6.1. To insert a Photo CD-format image into your doc-



SPLASH OF COLOR: Kodak Digital Science Photo Insert works with popular word processors to add color photography to standard documents.

ument, you simply click on the Photo Insert icon in your word processor, automatically launching the utility.

From there, you select from

among 16 certificate, newsletter, poster, and letter templates that provide a framework for your documents. Then you choose the photo you wish to use and crop it to fit the space allotted. Photo Insert does the rest, using an OLE 2.0 interface to work with word processors to select the best image size and resolution for each job.

As a bonus, Photo Insert makes it easy to catalog your collection of Photo CDs and view thumbnails of your photos in a slide-like fashion. You can name both Photo CD disks and individual images using filenames up to 64 characters long.

If your sales reports or newsletters are looking a bit dull, Kodak Digital Science Photo Insert Software is a quick and easy way to liven them up with color snapshots.

Kodak Digital Science Photo Insert software. List price: Free with Photo CD. Requires: 8MB RAM, 1.5MB hard disk space, Microsoft Windows 3.1 or later. Eastman Kodak Co., Rochester, NY; 800-235-6325; Web, <http://www.kodak.com>.

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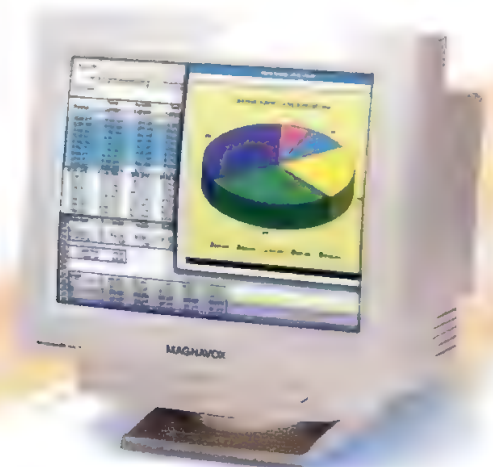
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First Looks



AT YOUR FINGERTIPS: The ConcertMaster's built-in SRS 3-D circuitry is controlled by an on/off switch on the keyboard, which also has a useful mute button. The Maxi Sound relies on a slide control to adjust the volume.

KEYBOARDS

The Sound and Fury: Multimedia Keyboards Integrate Audio

By Brian Nadel

Until now, the most important sound-related decision surrounding the selection of a keyboard has been whether to choose a quiet or "clicky" model. As desktop PCs become multimedia machines, another debate rages over the best method of integrating audio into this computing commodity. Though Maxi Switch's \$89 Maxi Sound and NMB Technologies' \$129.95 ConcertMaster keyboards each include built-in stereo speakers, a microphone, and all the expected keys, they are as different as Hillary Clinton and Newt Gingrich.

Both the ConcertMaster and the Maxi Sound are built from full-size keyboards with 12 function keys along the top row. The ConcertMaster adds the now de rigueur 3 Windows 95-specific keys.

From a purely functional standpoint, both will get the typing job done, but the ConcertMaster has a mushier, less distinct feel—though its keys have longer travel than those of the Maxi Sound. Neither contained an integrated pointing device, a feature now available on a variety of basic keyboards.

LONG AND SHORT OF IT

Of the two, the Maxi Sound is smaller; it is hardly bigger than a standard keyboard and its speakers barely protrude from the upper corners. The Maxi Sound's 18- by 8.5-inch footprint takes up

less desktop real estate than the ConcertMaster's 18.3- by 9.5-inch footprint, and even with the keyboard's legs extended to tilt the typing surface, the Maxi Sound is still at least an inch shorter. Both keyboards easily connected with several different PCs using DOS, Windows 3.1, and Windows 95.

Both keyboards have integrated power amplifiers, although the ConcertMaster's 4-watt output is slightly higher than that of the Maxi Sound, which has a 3.5-watt rating. The ConcertMaster also

Sound were in the same acoustic league as our reference system, a pair of Bose MediaMate speakers. Neither keyboard will satisfy the multimedia author seeking an accurate representation of what's being recorded or the PC user looking for pure sound.

The ConcertMaster includes two extras that extend its audible range. First, there's built-in SRS 3-D circuitry, which can be controlled by an on/off switch on top of the keyboard. Though our experience has been that SRS can add depth and definition to a sound card's output, in this case it was hard to detect any major difference in sound quality. Second, in addition to the expected array of plugs for connecting the key-

MULTIMEDIA KEYBOARDS			
	MaxiSwitch	Maxi Sound	NMB ConcertMaster
List price	\$89.00		\$129.95
Dimensions (HWD)	2 x 18 x 8.5 inches		3 x 18.3 x 9.5 inches
Amplifier power	3.5 watts		4 watts
Frequency response	120–15,000 Hz		50–20,000 Hz
Windows 95 keys			✓
Volume control	Vertical slide		Circular knob with mute button

has the broader frequency response of 50 Hz to 20 kHz, compared with the Maxi Sound's range of 120 Hz to 15 kHz.

But on a series of side-by-side, anecdotal tests with a variety of computer and CD-based audio sources, the Maxi Sound, which uses speakers made by Altec Lansing, provided the richer and fuller sound of the pair—though it was noticeably lacking in bass. On the downside, neither the ConcertMaster nor the Maxi

board to an external microphone and headphones, the ConcertMaster also offers a connection for an external subwoofer box for better bass response.

The type and variety of controls also separate these multimedia keyboards. The ConcertMaster wins the button contest with knobs for adjusting volume and for switching between the speakers and microphone, as well as the one for SRS control. There's also a handy mute button for instantly quieting a room. Though mute but-

tons are becoming common on system units, this is a must-have feature on a multimedia keyboard, particularly in an office. By contrast, the Maxi Sound has a slide volume control in the upper-right corner that can quickly silence the keyboard's speakers. The unit does not require you to switch manually between speaker and microphone to avoid feedback.

TALK TO ME

Using Windows 95's highest sampling rate of 44 kHz, the ConcertMaster provided the superior recorded sound of the two. This is likely because of the microphone's position near the top of the keyboard, which is closer to the speaker's mouth than the Maxi Sound's microphone, which is mounted below the Spacebar near the user's midsection. Both microphones are monaural, but each keyboard has a stereo-input microphone jack.

Though each product has its positive and negative aspects, the biggest design shortcoming of the pair is the profusion of cables required to make all the connections. Each uses a thick hydra-headed cable that splits near the end to produce plugs for an external microphone, external speakers, and power. In this age of wireless communications, cutting the cable should be the next step for multimedia keyboards.

Between the two, the Maxi Sound provides the best balance among size, sound reproduction, and price. The ConcertMaster, on the other hand, is slightly more powerful, has a microphone that is better positioned, and gives you the option of later adding an external subwoofer. Either way, with keyboards that speak, type, and listen, the modern office will never be quite the same—or sound the same.

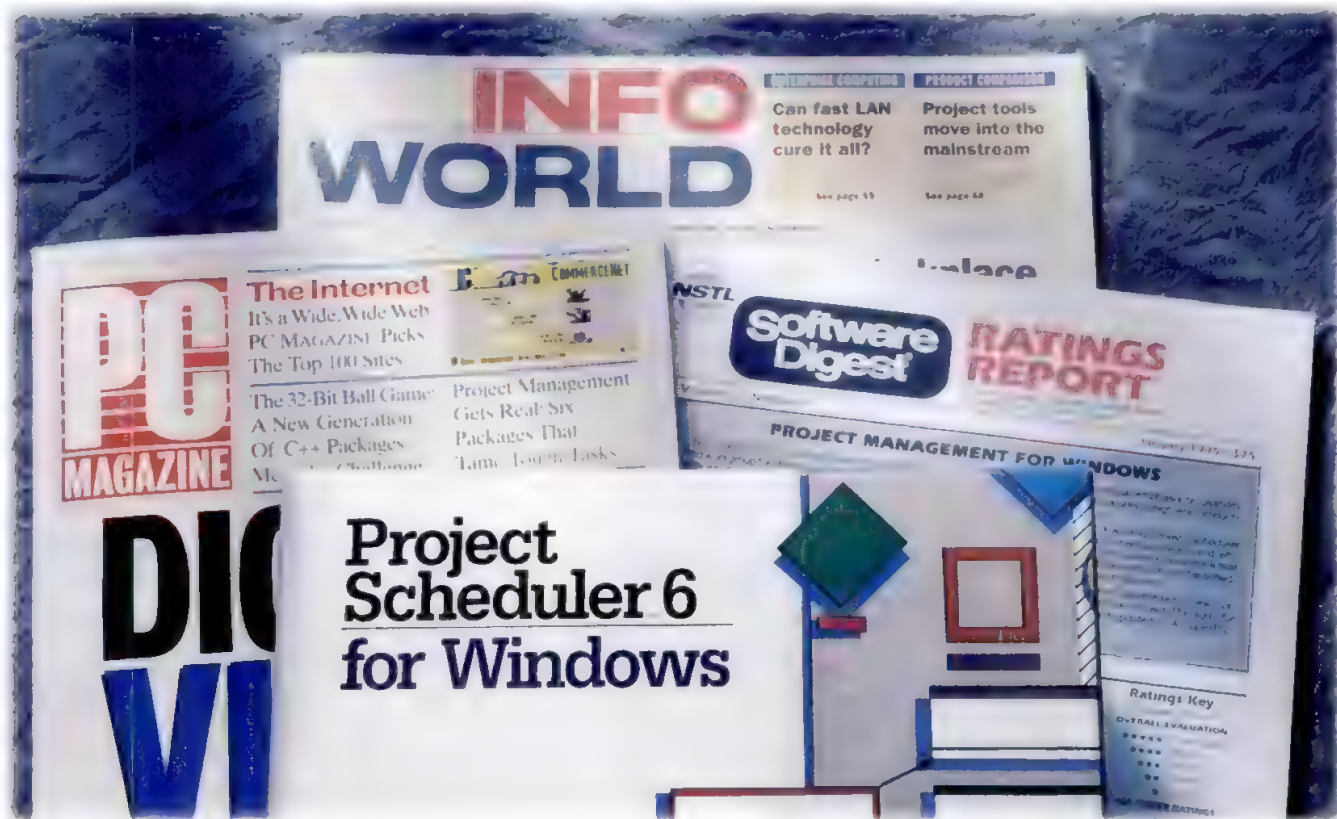
ConcertMaster. List price: \$129.95. Requires: PC with PS/2 keyboard port and sound card. NMB Technologies Inc., Chatsworth, CA; 800-854-2465; fax, 818-341-8207.

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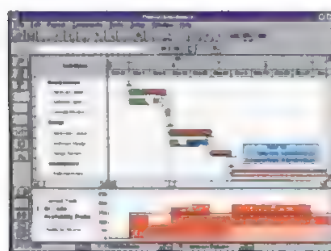
Maxi Sound. List price: \$89. Requires: PC with PS/2 keyboard port and sound card. Maxi Switch Inc., Tucson, AZ; 602-746-9378; fax, 602-741-9184.

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SPREADSHEETS

Go Figure: A Free-Form Spreadsheet Alternative

By J.W. Olsen

Villa Crespo's \$99.99 Go Figure defies pigeonholing. Think of it as a spreadsheet without cells or as an object-oriented mathematical problem solver with powerful "what if" capabilities to play out varying scenarios. However you look at it, if your problem lends itself to numerical analysis, you can probably solve the problem in Go Figure without knowing a row from a column.

Everything you create in Go Figure's workspace is an object, and the application provides a diverse variety of object types. For example, to gain control of your credit card, you first select the formula icon on the toolbar and navigate among 12,000 well-organized, predefined formulas to place the appropriate object in the workspace. Then you enter the amount charged, annual percentage rate, and monthly payment. The total payment is automatically calculated.

Once the formula is set up, you can edit the variables, perhaps by replacing the interest rate for one of your cards with that of another one to determine the best method of paying off debts. Or you can adjust the total payment and work backward to determine the best monthly payment.

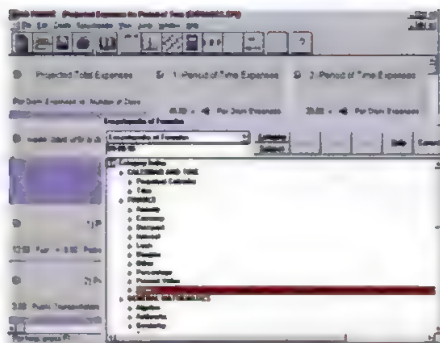
Next, by clicking on another icon, Go Figure can create a bar chart and link the amount charged and the total payment to the two bars. Now you can better see the changes in the relationship between the two values as you change the underlying data.

A spotlight object can be linked to values such as total payment. The object displays a red, green, or yellow light, depending on the value. Later, you might add objects that list individual charges for various credit cards and link the charge total to your original formula object.

Other objects include calendars (relationships between dates), equations (user-created formulas), bookmarks (document navigation), and a versatile

tape calculator. The predefined formulas cover areas such as finance, general math, physical science, time, unit conversion, and special interests such as computers.

Like most first releases, Go Figure has some minor rough edges. Inexplicably, you can't delete saved documents from within Go Figure; you must use



SWISS ARMY SPREADSHEET: Go Figure provides point-and-click access to 12,000 formulas.

File Manager instead. And Go Figure is a computational island with no way to link external data directly to objects. In our example, credit-card specifics stored in

another program must be transferred via the Windows Clipboard or reentered in Go Figure. The manuals, though extensive, are primarily reference tools. So you're on your own when it comes to learning Go Figure's novel conventions, a process that can require some trial and error. Villa Crespo plans to ship a tutorial to all users.

Go Figure is a handy alternative to traditional programs for the spreadsheet-challenged.

Go Figure. List price: \$99.99. Requires: 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. Villa Crespo, Highland Park, IL; 800-521-3963, 708-433-0500; fax, 708-433-1485.

Circle 406 on reader service card

PIMs

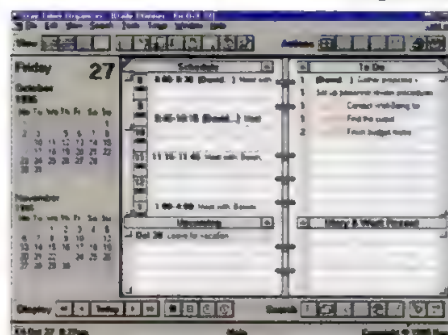
Day-Timer Organizer 2.0: More Power, Same Comfortable Look

By David Haskin

Day-Timer Organizer 2.0 is a powerful personal information manager (PIM) that is as familiar as your Day-Timer notebook. This \$59 upgrade adds new database and communications power yet retains its comfortable day-by-day format.

Organizer's phone capabilities are now based on the Windows 95 TAPI specification. They include support for Caller ID, call forwarding, and hold. The package comes with DLLs to implement its TAPI capabilities in Windows 3.x.

As with previous versions, you can create and view categories of database items and delegate tasks to others. For example, you can view the contents of a "hot prospects" category or look at all the tasks assigned to a specific person. Now, however, you can sort records within categories and take a look at to whom each task has



LOOK FAMILIAR? Day-Timer Organizer's scheduler mimics the printed notebook calendars.

been assigned as well. Organizer now supports forms-based searching and Boolean queries, though it provides no assistance with developing these complex searches.

A new mail-merge function lets you select records, launch your word processor, and apply included merge templates. Though the selection of merge templates is easy to use, it's slim and doesn't work with 32-bit word processors. The next release of Organizer will rectify this shortcoming.

Links within the database enable you to keep tabs on related items. For example, if you drag a name from the address book to the scheduler, that appointment automatically appears in the person's record. Organizer's scheduler

examines your personal calendar and those of workgroup members to find free time for meetings. It doesn't, however, display conflicts in the calendar or provide a warning message when they occur. Instead, you must use a dialog box to find conflicts.

Organizer automatically e-mails meeting notices to attendees, though they can't respond by accepting, declining, or delegating attendance as they can with other popular PIMs, such as Net-Manager's Ecco Pro. Another useful networking feature is the ability to share specific records.

One glaring weakness: The only common format Organizer can import is text. And it's excruciatingly slow, requiring more than 3 minutes to import 600 records on a Pentium/90 with 16MB of RAM.

Day-Timer Organizer's comfortable feel masks its thorough set of PIM features, making it a good choice for power PIM users.

Day-Timer Organizer 2.0. Estimated street price: \$59. Requires: 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later. Day-Timer Technologies, San Mateo, CA; 800-225-5005, 415-572-6260; fax, 415-572-9675.

Circle 405 on reader service card



From December 18 to 22, go on-line to discuss Day-Timer Organizer 2.0 with Rob Humphries, product development manager, and David Haskin, a reviewer at PC Magazine. Type GO EXEC on ZD Net/CompuServe Edition.

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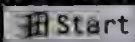
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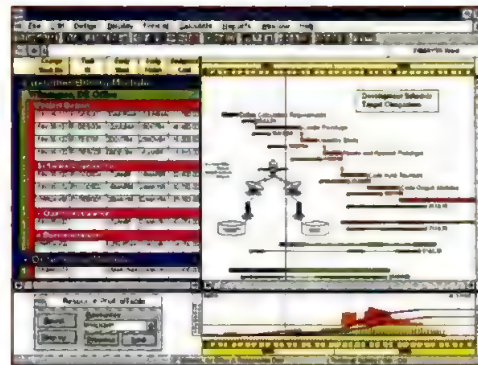
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NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Melissa J. Perenson

The Mouse That Keeps Going and Going...

The \$49 Key Tronic Mouse is proof that even a computer mouse can have nine lives. Originally released by Honeywell in 1992, **Key Tronic Corp.**'s reincarnation retains the unique design that made The Honeywell Mouse such an innovation

then and continues to do so now. In lieu of the traditional rollerball on the underside of the mouse, The Key Tronic Mouse uses two plastic, disk-like opto-mechanical feet to track your movements. The frictionless internal-mechanism design eliminates the need for cleaning out the troublesome dirt,

dust, or residues that often plague the performance of standard mice. And you can use the device at any angle on any surface, sans mouse pad. The mouse requires a serial port and includes three swappable button plates in three-button and two-button right-handed and left-handed configurations.

The Key Tronic Mouse. List price: \$49. Key Tronic Corp., Spokane, WA; 800-262-6006, 509-928-8000; fax, 509-927-5224.

Circle 420 on reader service card

Language Translator

It used to be that automated natural-language translation, also known as machine translation, was strictly a mainframe technology. **Systran Software's** Systran Professional for Windows brings that technology to the desktop. Available in 28 language combinations in both standalone and network versions, Systran Professional is a 32-bit package that provides language translation using sizable and customizable multilingual dictionaries, including idiomatic phrases and 20 topical glossaries for context-sensitive translations. The software deftly handles accented characters and retains the page layout of original documents. **Systran Professional for Windows.** List price: \$1,495 per language combination. Systran Software Inc., La Jolla, CA; 619-459-6700; fax, 619-459-8487; e-mail, info@systranmt.com.

Circle 416 on reader service card



Multimedia Powerhouses

Compaq Computer Corp. may have been late to the multimedia-notebook party, but the modular Compaq LTE 5000 goes a long way toward making up for lost time.

Prices start at \$3,999 for a basic configuration. You can get either a 75- or 90-MHz Pentium processor, 72MB of RAM, an 11.3-inch dual-scan or a 10.4-inch active-matrix screen, and hard disks ranging in size from 510MB to 1.35GB. The system also comes with an IrDA port, two Type III PC Card slots, and either a lithium ion or nickel hydride battery.

This multimedia system has PCI local-bus graphics, an MPEG and TV video adapter, integrated audio, and stereo speakers mounted on the display. The modular front MultiBay lets you add your choice of a double-speed CD-ROM drive that supports 5.25- and 3.5-inch CD formats, a second hard disk, or a floppy disk.

If the LTE 5000's standard 8MB of RAM is not sufficient for your needs, **Kingston Technology Corp.** has memory-upgrade kits that are guaranteed by Kingston to be 100 percent compatible with the LTE 5000's hardware. The kits are available in 8MB, 16MB, 32MB, and 64MB capacities, with prices starting at \$500 for an 8MB SIMM and \$860 for a 16MB SIMM.

Compaq LTE 5000. List price: Starts at \$3,999. Compaq Computer Corp., Houston, TX; 800-345-1518; fax, 713-518-1442.

Circle 417 on reader service card

Kingston Compaq LTE 5000 Memory Kits. List price: Starting at \$500 for 8MB. Kingston Technology Corp., Fountain Valley, CA; 800-337-8410, 714-435-2600; fax, 714-435-2699.

Circle 418 on reader service card

Business Law 101

Need some plain-English legal counsel? Turn to Kiplinger's Small Business Attorney, a \$49.95 advisor from **Block Financial Corp.** The program is designed to offer legal guidance geared toward small businesses, entrepreneurs, and consultants. There are over 80 contracts, letters, and assorted other legal documents; an integrated word processor; and discussions on over 60 business-law topics. Home users can turn to Kiplinger's Home Legal Advisor, a \$29.95 package that includes 68 contracts and documents geared toward personal and consumer concerns, Kiplinger's Handbook of Personal Law, and details on over 80 related legal topics.

Kiplinger's Home Legal Advisor. List price: \$29.95.

Kiplinger's Small Business Attorney. List price: \$49.95. Block Financial Corp., Kansas City, MO; 800-813-7940, 816-751-6000; fax, 816-751-6020.

Circle 415 on reader service card

Virtual Travelers

With the dreariness of winter settling in, are you trading your visions of dancing sugar plums for visions of a balmy tropical setting? If so, point your World-Wide Web browser to **The Travel Channel Online Network** at <http://www.travelchannel.com>. The Travel Channel is leveraging its experience as television's foremost source of travel information and travel-ogues to put together this impressive Web site.



GLOBETROTTERS: The Travel Channel's Web site aims to be a source of travel-related information.

The site's tourism archives complement and supplement the network's TV programming, with an impressive number of links to other Internet travel sites. The site also provides original content covering places, events, cultures, and cuisines.

The Travel Channel Online Network. New York, NY; Web, <http://www.travelchannel.com>.

Widening the 3-D Space

Three-dimensional graphics are not just for graphics professionals anymore. Priced at just \$149, **Caligari Corp.**'s trueSpace/SE for Windows is poised to help redefine the entry-level 3-D graphics-software market by providing a full-featured, easy-to-use, affordable 3-D graphics and animation package. With trueSpace/SE, you can do 3-D modeling and rendering as well as broadcast-quality animations. Working in a 3-D perspective space, you fully manipulate objects in real time, creating 3-D objects, animations for video output, flying 3-D text, and more.

trueSpace/SE for Windows. List price: \$149. **Caligari Corp.**, Mountain View, CA; 800-351-7620, 415-390-9600; fax, 415-390-9755.

Circle 419 on reader service card

HP's Latest Vectra

The sleek HP Vectra VL4 MT series, which is available with 90-, 100-, 120-, and 133-MHz Pentium CPUs, redefines **Hewlett-Packard Co.**'s value business line with prices starting at \$2,040 for the VL4 5/90 MT with a 90-MHz Pentium, 8MB of EDO RAM, a 1GB hard disk, an S3 Trio64 64-bit graphics card with 1MB of VRAM, and burst-synchronous cache on an HP-designed motherboard (multimedia is optional in this configuration). The thoughtfully designed mini-towers, which have compact footprints, feature the Macintosh-esque StartKey, which lets you power-on the PC by just touching the Spacebar. At the higher end of the spectrum, a 120-MHz Pentium with 16MB of RAM, a quad-speed CD-ROM drive, and a 16-bit sound card costs \$3,549.

HP Vectra VL4 5/90 MT. List price: \$2,040. **Hewlett-Packard Co.**, Palo Alto, CA; 800-752-0900; Web, <http://www.hp.com>.

Circle 414 on reader service card



HP VECTRA: Puts your CD-ROM within reach.

A Home Recording Studio

Half the fun of owning a recordable CD-ROM drive is the potential to create your own disks. **Corel Corp.**'s \$495 Corel CD Creator, Version 2, builds on the strong start of its first release and adds a host of features that guarantees to make recording CD-ROMs a breeze. Almost everything has been enhanced in this 32-bit multithreaded Windows 95 application, including the data, the jewel case, the audio-track editors, and the Disc Wizards, which walk you through the process of recording a disk. The new features provide such helpful things as improved algorithms for disk optimization, file priori-

HARDWARE BRIEFS

Time to add more memory to your PC? **PNY Electronics** is now offering EDO (extended data out) memory modules. EDO memory supports a faster data bus, which increases your system's performance. PNY has 8MB 2x32 (\$400) and 16MB 4x32 (\$700) modules. 201-438-6300.

TDK's \$529 V.34 DF2814 Global Class Data/Fax Modem PC Card supports 17 countries' standards without requiring an external line adapter. The card has an internal programmable DAA phone-line interface circuitry so that it may be easily configured for use in different countries. 800-999-4835, 916-478-8421.

For a bare-bones, powerful system, **Compaq Computer Corp.**'s ProLinea 5120E swings a good punch at the competition. For \$2,099 you get a Pentium 120-MHz CPU, 8MB of RAM, and a 1GB hard disk. 800-345-1518.

Miss the telephony functionality available today? **Comdial's** \$100 PATI 3000 is a compact solution for integrating your telephone with your computer. The TAPI-compliant device lets you link analog phone lines to your PC so that you can place phone calls directly from your PC. 804-347-1432.

You've seen it for audio CDs, and now **JVC** has come up with a 100-disk CD-ROM jukebox as well. Sold through Marcan, the \$6,000 JVC CL-100 CD Library provides access to 68GB, with CDs held in two stacks of 50 for easy access. The included software features asynchronous access for simultaneous use of networked drives. 800-635-7477.

For the complete messaging product, consider **Hayes Microcomputer Products'** \$579 Hayes Optima 288 Business Modem. A sleek external unit, the modem features V.42bis, remote configuration, security controls, flash memory for easy firmware upgrades, a voice-messaging system, fax-on-demand, Caller ID, and distinctive rings and call routines for voice, data, and fax. 770-441-1617.

The \$995 Fujix Photo-Video Imager FV-7, from **Fuji Photo Film U.S.A.**, is a 2-pound device that easily displays negatives, slides, and any other real object on a television or a computer. 800-659-3854, ext. 2571.

Proxima's \$6,295 Desktop Projector 2400 provides a compact 21-pound LCD projector that's designed for use in well-lit rooms. The device is plug-and-play-compatible with both the Macintosh and the PC and supports NTSC, PAL, SECAM and S-VHS video. 619-457-5500.

tization, and CD Plus support. The package is bundled with Corel Presents for Multimedia Authoring, PhotoCD Creator, and VideoCD Creator.

Corel CD Creator, Version 2. List price: \$495. **Corel Corp.**, Ottawa, Ontario, Canada; 800-772-6735, 613-728-8200; fax, 613-761-9176.

Circle 413 on reader service card

Language of the Rising Sun

Have a yen for the Japanese language but feel intimidated by the 2,000 Kanji characters you'll need to master? **Pacific Software Publishing's** \$129 Kantaro will help you master the ideographic symbols that comprise Japan's written language through mnemonics, animated graphics, reading exercises, pronunciation drills, and games.



PICTORIAL TUTORIAL: Kantaro uses illustrations and animations to teach you Kanji.

Language Engineering Corp.'s LogoVista E to J 2.5 is a \$995 translation system for translating English ASCII files into Japanese Shift-JIS format for use with Japanese applications. The 32-bit software includes an upgraded 120,000-entry main dictionary that supports supplemental dictionaries defined by the user, and 21 add-on Technical Dictionaries. Manual overrides let you select alternative translations of a word.

To help bring you up to speed on the finer aspects of Japanese society and culture, **Digital Destinations'** \$69 Destination Japan offers a cultural guide geared at business and recreational travelers. This searchable, no-frills program is chock-full of pertinent historical facts and photos. There are also business profiles and directory information for hotels, businesses, restaurants, various professional firms and services, and government offices.

Kantaro. List price: \$129. **Pacific Software Publishing Inc.**, Bellevue, WA; 800-232-3989, 206-562-1224; fax, 206-562-0811.

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LogoVista E to J 2.5. List price: \$995. **Language Engineering Corp.**, Belmont, MA; 800-458-7267, 617-489-4000; Web, <http://www.lec.com>.

Circle 422 on reader service card

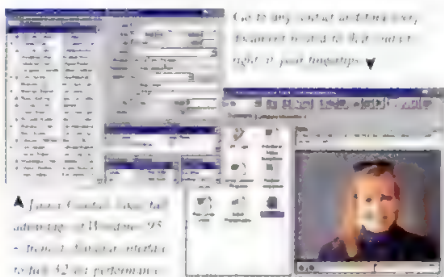
Destination Japan. List price: \$69. **Digital Destinations**, Davis, CA; 800-204-4404, 916-757-2323; fax, 916-757-2992.

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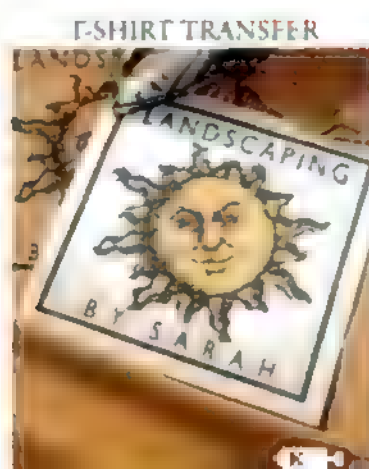
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Do you need to save some space on your desk? **ViewSonic Corp.**'s \$700 multimedia monitor, the ViewSonic 17EA, is a terrific deal. The monitor features a 16-inch-diagonal display, an 85-Hz refresh rate at 1,024-by-768, and resolutions up to 1,280-by-1,024. The plug-and-play monitor includes built-in stereo speakers mounted below the display. ViewSonic's utilities offer on-screen image-color control.

For a higher-end implementation of the same concept, **Apple Computer's** \$1,159 AppleVision 1710AV provides a cross-platform solution for those looking for an audio-visual display that combines superior image-quality technology with integrated stereo speakers and a microphone.



SOUND ON THE SIDE: The ViewSonic 17EA features integrated sound.

The 16.1-inch-diagonal display features next-generation Sony Trinitron CRT technology for crisp, sharp, and vivid colors. Resolutions up to 1,280-by-1,024 are supported and there's automatic color calibration and screen-to-print color matching

using Apple's ColorSync 2.0 technology. The monitor is plug-and-play-compatible across DOS, Microsoft Windows, Macintosh, and Power Macintosh systems.

ViewSonic 17EA. Estimated street price: \$700. ViewSonic Corp., Walnut, CA; 800-888-8583, 909-869-7676; fax, 909-869-7958.

Circle 411 on reader service card

AppleVision 1710AV. List price: \$1,159. Apple Computer Inc., Cupertino, CA; 800-538-9696, 408-996-1010; fax, 800-462-4396.

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By the Numbers

SourceMate Information Systems' \$995 Visual AccountMate is one of the first 32-bit accounting packages out the gate for Windows 95 and Windows NT. Geared toward small to midsize businesses, Visual AccountMate consists of seven modules that can be mixed and matched as needed. There are user-defined hot buttons that you can assign to your most commonly used functions, as well as unobtrusive access to important micro information within a given field, a powerful search engine, and transaction rollback.

Visual AccountMate. List price: Starts at \$995. SourceMate Information Systems Inc., Mill Valley, CA; 800-877-8896, 415-381-1011; fax, 415-381-6902.

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SOFTWARE BRIEFS

Trying to figure out the costs associated with a particular project? **SoftSys's** \$139 EstimatorPlus for Windows will help save you time and energy by providing an easy-to-use relational database to create estimates, invoices, and reports for any service-oriented business. 905-619-8093.

If your cupboards are bare and you still need to pull together dinner, try consulting **Upstill Software's** \$49.95 Mangia. The appeal of this CD-ROM cookbook is that if you tell it which ingredients you have on hand, it will search its database of more than 800 recipes to come up with a dish. 510-526-0178.

Organize your text files with **DS Products'** \$23 QRead Version 95-2.0. A Windows 95 shareware utility, QRead helps you sort through and read text files; a Reading List makes it even easier to track what you still have to read. E-mail, 70731.1673@compuserve.com.

Visual Arranger, from **Yamaha Corp. of America**, is a \$59.95 music-arrangement and -composition package that makes it easy to create original compositions for those without musical backgrounds. The package has a drag-and-drop iconic interface and eight accompaniment groups, each with additional styles. 800-823-6414.

Ares Software Corp.'s \$79.95 Font-Minder 3.0 brings this font management utility to both Windows 95 and Windows 3.1. The new tabbed interface makes it easier to control your font library, and with the Directory mode, you can now install and uninstall fonts on removable media. 800-783-2737.

Time to write up those expense reports? Make the process that much easier with **Portable Software's** \$99.95 QuickX-pense for Windows 95. Also compatible with Windows 3.1, this painless package includes HotelXpert, which simplifies entering your hotel expenses. If you have a GE Capital Corporate MasterCard, you'll find a direct link to that card that makes things even easier. 800-478-7411.

With **Duxbury Systems'** \$495 Duxbury Braille Translator for Windows, Windows word processors can now be used to convert printed text into Braille and vice versa. The software supports grade 2 American, British, French, and Spanish Braille. You can also translate word processing documents, scanned images, and files from other sources. The Braille can be edited and displayed graphically with included fonts. 508-486-9766.

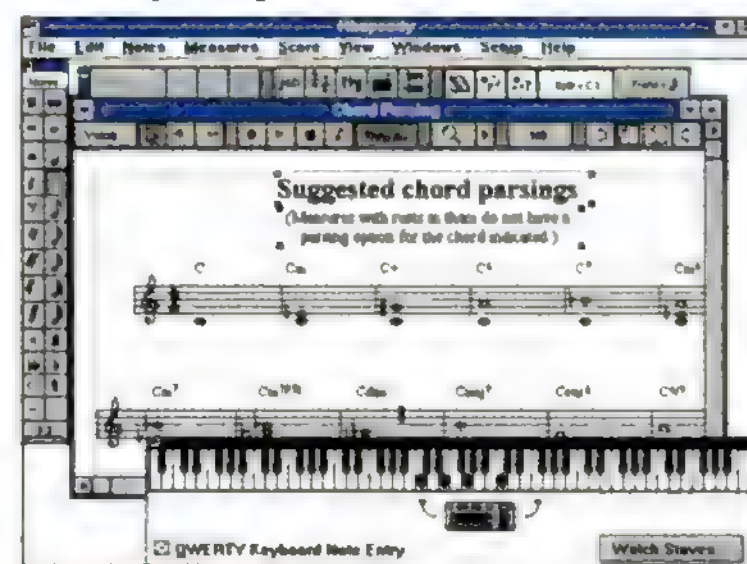
Of Digital Concertos And Rhapsodies

Here's an assortment of sound-editing packages for musical novices and professionals alike.

From **Passport Designs**, there's Rhapsody, a \$249 CD-ROM package designed to expand and develop the creativity of amateur and professional musicians. Rhapsody lets you transcribe and input standard notation manually via a MIDI keyboard or a QWERTY keyboard, so you can start playing and creating music simultaneously; 32 staves allow you to create complete orchestrations with up to 32 separate instruments.

Cakewalk Music Software's \$399 Cakewalk Pro Audio targets the professional musician with a MIDI and digital-audio recording system. The package integrates MIDI and digital audio so that you can incorporate vocals or any other audio input into a multitrack MIDI sequence. You can record, edit, and play back multiple tracks of synchronized MIDI and digital audio. The \$479 deluxe CD-ROM version comes with the Musician's Toolbox, a collection of sound-editing tools and multimedia files.

Another MIDI and digital-audio sequencer is **Voyetra Technologies'** \$159 Digital Orchestrator Plus. The software lets you edit and synchronize digital audio with MIDI tracks and record and play independent digital-audio tracks, which can be synchronized with MIDI tracks. There's drag-and-drop audio editing, support for multiple sample rates, a real-time MIDI track sequencer, and the ability to import .WAV files.



PLAY IT AGAIN, SAM: Passport Designs' Rhapsody makes it easy to create music.

Rhapsody. List price: \$249. Passport Designs Inc., Half Moon Bay, CA; 800-443-3210, 415-726-0280; fax, 415-726-2254.

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Cakewalk Pro Audio. List price: \$399. Cakewalk Music Software, Watertown, MA; 800-234-1171, 617-926-2480; fax, 617-924-6657.

Circle 426 on reader service card

Digital Orchestrator Plus. List price: \$159. Voyetra Technologies, Yonkers, NY; 800-233-9377, 914-966-0600; fax, 914-966-1102.

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REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

Learning the Tricks to On-Line Marketing Success

BY BRUCE BROWN

eMarketing, by Seth Godin, covers a broad range of electronic marketing venues. It is filled with interviews and articles by experts in fax back systems, multimedia, infomercials, bulletin boards, audiotext, on-line services, and the Internet. In this fairly short book (260 pages), Godin covers a lot of ground in surprising depth, including lists of possible applications, selected resource lists, and glossaries for each electronic medium.

More than an electronic marketing overview, *eMarketing* provides a good introduction to specific marketing vehicles. Since the excerpts, short articles, and interviews by experts are written by different people, the changes in writing style are noticeable (particularly in interviews containing long-winded responses to short questions), but Godin's consistent organization keeps the material all in hand.

Guerilla Marketing Online, by Jay Conrad Levinson and Charles Rubin, offers a strategic game plan for electronic marketing. *Guerilla Marketing* portrays the various parts of commercial on-line services, the Internet, and bulletin board services as battlegrounds on which you can plot and plan your way to hard-fought victory.

Written for business people with varying levels of electronic

expertise, *Guerilla Marketing* is likely to pump you up with the potentials for on-line marketing, with step-by-step instructions on what to do and how to do it. Mindful of how leery many people still are about on-line commerce, for example, the book suggests ways to convince potential customers of your on-line store's permanence and how to follow up after sales to reassure customers and to gain additional sales.

Levinson and Rubin emphasize the importance of understanding and working in the cultures of the various on-line arenas, in particular stressing the relative advantages of and differences between commercial on-line services—such as America Online, CompuServe, and Prodigy—and the Internet.

While the book is packed with information and strategy, *Guerilla Marketing Online* is less a study of the potentials of on-line enterprises than a plan for aggressively pursuing customers.

Marketing on the Internet, by Jill H. Ellsworth and Matthew V. Ellsworth, focuses primarily on

the World-Wide Web. Filled with screen shots of Web pages, this is the book to read if you're looking for help in designing and using home pages for your own enterprise's Web site. The authors write a little about doing business on the World-Wide Web, but most of the book is devoted to gaining access to the Internet and the Web, the differences between Web browser programs, business resources on the Internet, and how to program basic and more advanced Web pages.

The authors state that *Marketing on the Internet* is intended for Internet novices as well as more experienced users, and the book does define terms, but it quickly moves to how-to-steps. So if you're not sure how and why you'd want to be on the World-Wide Web you might want to start with a broader, more introductory text. If you're already sure your business belongs on the Web, however, *Marketing on the Internet* provides an introduction to HTML programming and presents many sample home pages with a look at the HTML code used to create them.

Marketing Online, by Marcia Yudkin, teaches you how to schmooze on-line. The least

technical of the four books covered here, Yudkin's book focuses on the ethics and expectations of on-line services, the Internet, and bulletin boards. Much of the emphasis in *Marketing Online*

is on establishing relationships with on-line denizens, maintaining your on-line reputation, and exploring ways to solicit business without offending people.

Yudkin's preparation for this book included interviewing many people with experience doing business on-line, as well as columnists and others

who frequently appear in various services. The author discusses how to avoid flame wars (and what to do when they occur) and ways to get business without blatantly asking for it. For example, in one of the three

chapters on schmoozing, Yudkin demonstrates the differences between schmoozing and outright solicitation.

eMarketing, by Seth Godin, \$14.00. Perigee Books, 800-223-0510; ISBN: 0-399-51904-1.

Circle 441 on reader service card

Guerilla Marketing Online, by Jay Conrad Levinson and Charles Rubin, \$12.95. Houghton Mifflin, 800-225-3362; ISBN: 0-395-72859-2.

Circle 442 on reader service card

Marketing on the Internet, by Jill H. Ellsworth and Matthew V. Ellsworth, \$24.95. John Wiley & Sons Inc., 800-225-5945; ISBN: 0-471-11850-8.

Circle 443 on reader service card

Marketing Online, by Marcia Yudkin, \$12.95. Plume, 800-526-0275; ISBN: 0-452-27529-6.

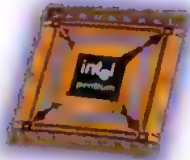
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READ ONLY RECOMMENDS

If you're involved with marketing high-tech products, you'll find Geoffrey A. Moore's *Crossing The Chasm* an interesting read. Moore offers a way to bridge the "chasm" between technology and the mainstream market. \$13.00; HarperBusiness, 800-331-3761; ISBN: 0-88730-717-5.

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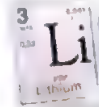
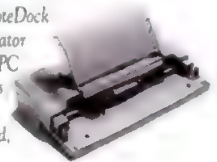
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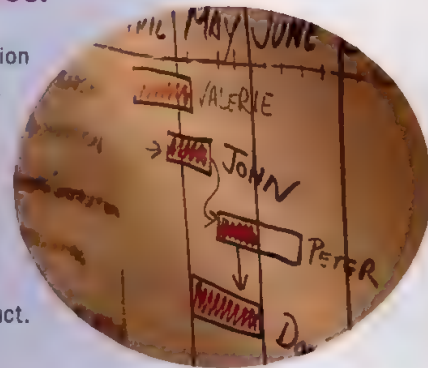
All prices, specifications and availability are subject to change. *Standard 640x480 resolution screen. **The 410CS is sold at selected resellers as the 415CS with Windows® 95 and additional pre-installed software.
†Price for 410CS with the modular FDD only. A Quad-Speed CD-ROM is available as an optional upgrade. ©1995 Toshiba America Information Systems, Inc. All products indicated by trademark symbols are trademarked and/or registered by their respective companies. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation.

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CIRCLE 286 ON READER SERVICE CARD

Looking Back... Looking for More

At this time of the year, it's traditional to look back at what's happened over the past 12 months and to look ahead at what's in store for the coming year. In 1995, we saw several great advances we weren't counting on, including the explosive growth

of the Internet. On the other hand, a number of the things we wished for just didn't materialize.

A year ago, writing this column ("What Will We Want Next Year," December 20, 1994), I said there were five technological advances I hoped we would see in 1995. Let's see if we got what we wanted and grade the performances in each category.

• **Better communications standards.** Last year, I said I wanted to see a universal e-mail system that really worked. Improved gateways, an easier-to-use interface, the ability to choose a word processor for editing, and easy replication of e-mail boxes on different machines would be a good start. Oh yes, and I wanted complete reliability and great administration tools.

Well, let's see: Microsoft shipped an in-box for Windows 95, but without enough drivers, it was a far cry from a universal e-mail box. However, Microsoft's in-box does let you use Word as an e-mail editor, which is a step in the right direction.

That's the good news. The bad news is that Microsoft's Exchange server—not to mention Lotus Notes 4 and its new cc:Mail client—were no-shows in 1995. Internet mail remains something separate, and while everyone is giving lip service to the concept of a universal mailbox, we're not much closer today than we were a year ago. *Grade: D-*

• **Multimedia standards that really work.**

Last year, I complained about the fact that most entertainment software seemed to require new and different CD-ROM and video drivers. We're still not completely over this hump, but in general, things have gotten a lot better. Most software vendors, frightened by increasing support costs and declining retail prices, have made their products much more compatible. And Windows 95's "autoplay" feature makes installing some of the new games easier. Yes, there's more work to be done, particularly for DOS-based games, but it's a big step in the right direction. *Grade: B+*

• **Real component software.** Once again, I don't care whether the solution is Microsoft's OLE, Component Integration

Lab's OpenDoc, Taligent's Application Environment framework (now called Commonpoint), Visual Basic, or something else. I do care that we get to a point where departmental computer experts as well as end users can mix and match tools from multiple vendors to create applications customized for the way we work.

I still believe this is important and that it will happen, but 1995 was a lousy year for software integration. I had high hopes for OpenDoc and Taligent's Application Environment framework; unfortunately, neither really came to fruition in 1995, with Novell backing off on its OpenDoc commitment and no one really backing Taligent's Commonpoint. Microsoft's OLE is still there, of course, and both Microsoft and CIL are still talking about new features for 1996. But from the standards point of view, we're still waiting for modular software that really works across multiple platforms and over networks, and that has developer support.

We certainly haven't seen any movement towards turning suites into sets of components that work with anyone else's. The now-orphaned PerfectOffice, with a cross-application macro language that really worked, came closest, but it didn't seem to fit with where Novell wanted to go. Lotus didn't manage to get out a big revision of SmartSuite during the year it was acquired by IBM (although it did launch a nice revision of its Ami Pro word processor, now called

Word Pro). Thus Microsoft Office took over the suite market almost by default.

We did see a little movement in software integration, with lots of vendors creating "Office-compatible" products and a few small, component-like programs such as Alpha Blox's OfficeBlox and the upcoming StarOffice. But overall, it doesn't feel like we're much closer to making component software a reality for end users. *Grade: D-*

• **Better tools for electronic publishing.** From print to CD-ROM to on-line publishing, the tools keep getting better, but I'm still convinced there's a long way to go.

For instance, we saw some progress in group-editing



MIXED REVIEW
Looking over
the list, we've
had mixed
results. Some
good, some not
so good.

MICHAEL J. MILLER

tools with products such as Lotus's Word Pro. But for the most part, those functions are still lacking in mainstream desktop-publishing tools such as QuarkXPress or Adobe Page-Maker. Similarly, the tools for CD-ROM creation, like Macromedia Director, have shown improvement but still need work.

On the other hand, there has been a big push in the area of on-line page creation, particularly in the form of new HTML tools. These range from programs geared toward professionals, such as HotMetal Pro, to applications aimed at less sophisticated users, such as Quarterdeck's WebAuthor.

Lastly, new browsers have given us ways of embedding things like Adobe Acrobat and Director files within Web pages. There's still a ways to go here, but the progress is palpable. Every month there's a new, cool tool that gives me hope for other forms of electronic publishing as well. *Grade: B-*

• **Light, portable desktop replacement systems.** Last year, I asked for a 4- or 5-pound machine with a Pentium processor, built-in CD-

ROM drive, 800-by-600 resolution display, and a 3- to 4-hour battery life. Though all these milestones have been attained, I didn't quite get them in one machine: The IBM ThinkPad 760CD has the CD-ROM drive and the display, while the Toshiba Portégé 610CT is lightweight with a substantial battery life. Still, the progress here has been nothing short of amazing, and I expect to get all of this combined in one box a year from now. *Grade: A-*

Hmm... Looking over the whole list, we've had mixed results. Some good, some not so good, and some disappointing. Bottom line: There's still plenty of room for improvement. But wait one second. Aside from these uneven marks, we've seen a lot of improvement in other areas.

Our basic operating systems became friendlier with the launch of Windows 95 and the refinements to OS/2 Warp. Also, operating systems are now designed to tie in better with networks and the Internet, and that's good.

In fact, the Internet itself has moved faster than I would have predicted, spawning new versions of browsers boasting ever more powerful features. Things like audio and chat on the World-Wide Web, electronic commerce,

and even virtual-reality technology are rapidly taking shape.

So what would I like to see in 1996? First, I want continuing progress in all the areas I enumerated last year, particularly in communications products and electronic publishing tools (which I expect we will see) and component-based software (which I'm more skeptical about).

I'd also like to see the Net continue to evolve, with new standards for better displaying pages, more advances in the emerging virtual-reality arena, and improved security. It would be great if we could see the major players all cooperating here, but that might be asking too much.

What else? How about CD-ROMs becoming simpler and more affordable, so we can all become CD-ROM creators? How about uniform regulations so we can finally get standardized high-speed connections at home? The establishment of a video-conferencing standard? Finally, how about a vendor that's smart, fast, and crazy enough to take on Microsoft in mainstream desktop applications?

Oh well, as a Rolling Stone song not licensed by Microsoft goes, "You can't always get what you want..." □



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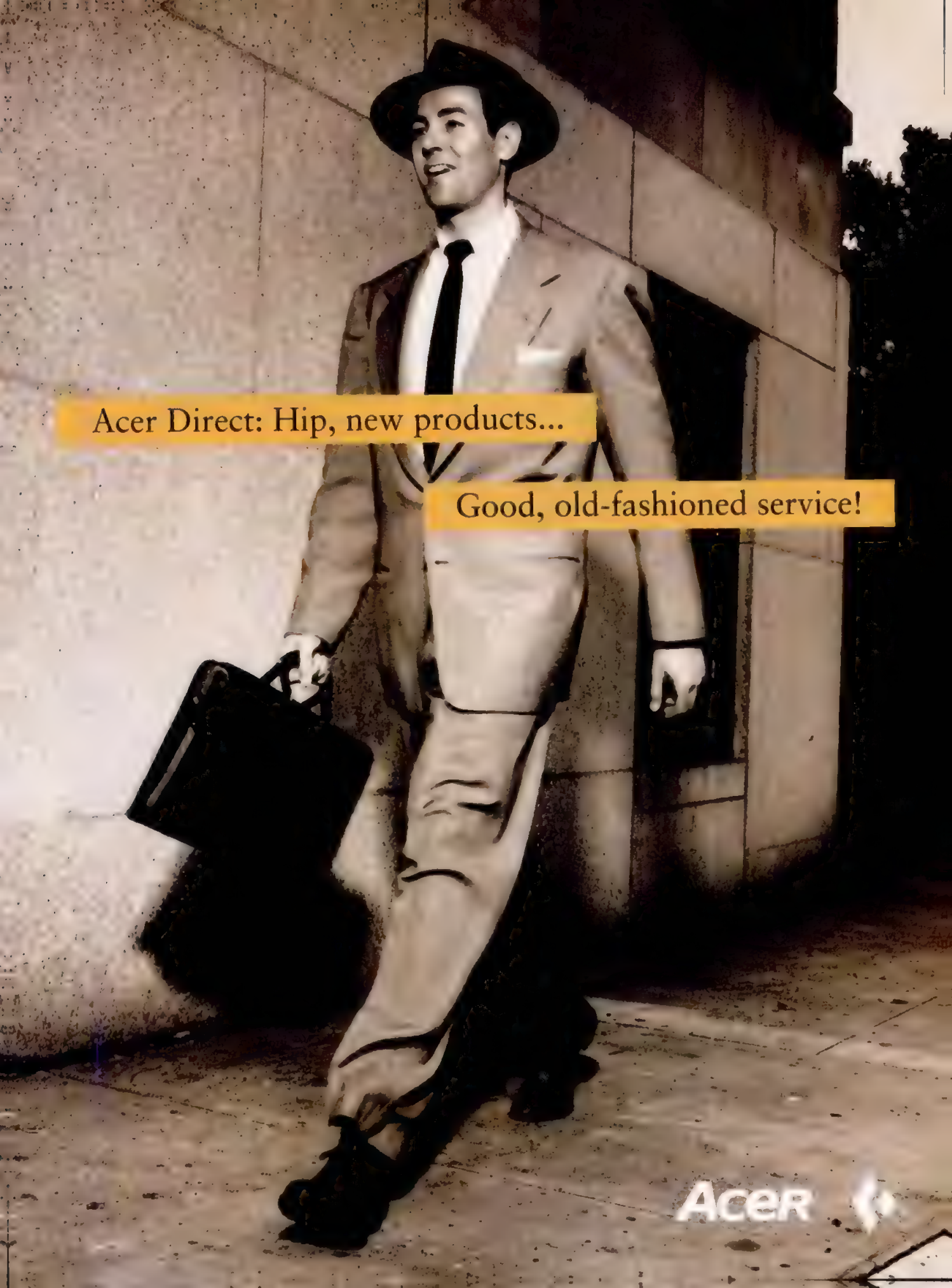
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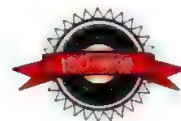
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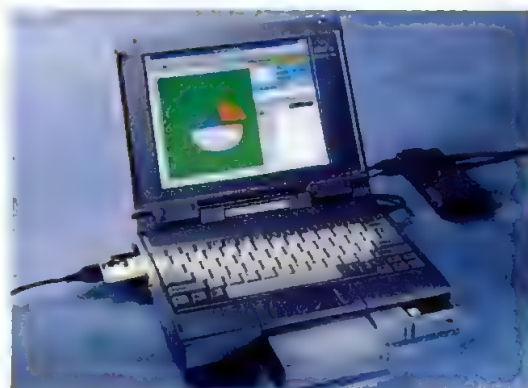


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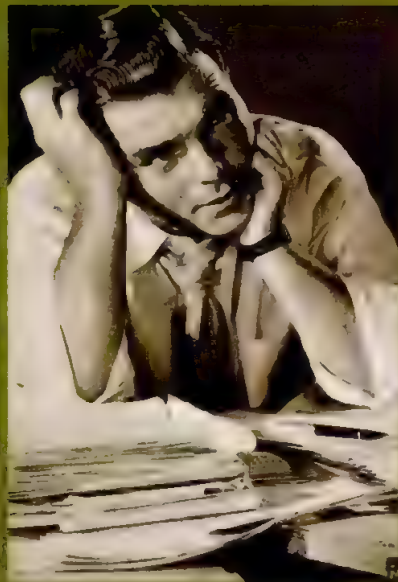
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Look Out for Shades of GRAYS

This is an expensive column for me to write. It's going to cost me some money. But it will be worthwhile, as you'll see. The Machrone household is weird in the way every family is weird: We speak a private language at home, replete with nicknames,

family jokes, old punch lines, fragments of songs, commercials, and, in our case, acronyms. For instance, "SDFAC" speaks volumes about dinner (Something Different For A Change, meaning that an experimental recipe is at hand). Sometimes we create new ones, challenging other family members to figure them out. Some are pronounced, others are spelled out.

The on-line world is thick with all sorts of acronymic abbreviations: IMHO, PMFJI, IANAL (I am not a lawyer, always followed by "but"), ROFL—the list goes on. So my family habits have bled over somewhat into my casual conversations in various on-line locales. Some of my acquaintances have picked up on my acronymic ways, and they've started doing it, too. I was commenting about some shareware I'd recently downloaded to an on-line buddy, and he replied with a one-word message: GRAYS.

GRAYS? I queried. GRAYS, he affirmed: Gotta Register All Your Shareware. It struck home. I'm pretty diligent about registering shareware programs that I know I'm going to use, such as Ed Tenholder's control program for the CP-290 module for X-10 light switches and dimmers. His registration fee is especially painless because he donates the proceeds to the Cystic Fibrosis Foundation. But even the purely commercial products are typically low-priced and relatively painless on our software budgets.

The heart and soul of shareware is try before you buy. In this try-now-pay-later world, however, later can be an awfully long time in coming, ceaselessly wandering in the endless corridors of good intentions. I decided then and there to look at my hard disk and see just what my debt to the shareware community might be. I keep all the .ZIP files I download in one place and build installation subdirectories under C:\TEMP, so they're pretty easy to find. I was surprised to find over 40 ZIPped files, but not all of them were shareware. Some, like Acrobat Reader and Netscape Navigator, are freely distributed browsers. Of the shareware, however, I discovered that I'd been a bad housekeeper. I'd tried a lot of shareware, but there was relative-

ly little that I was using day to day. The Trumpet Winsock, for instance. I tried it once, then abandoned it for the Winsock bundled by my Internet service provider. An ancient copy of Wizunzip (I use Norton Desktop's unzipper). Some games that we played a couple of times and lost interest in.

A file full of Warner Brothers cartoon figures and another full of sports icons, Bartman, Beavis and friends (the kids use the same machine for their on-line adventures; I deleted these before I could even fully grasp the copyright infringement implications.). A crossword program that was never run. An antediluvian copy of Grabit, a screen-grabbing and printing program for Windows. Like some of the others, I could find no sign of ever having installed and run it.

On the other hand, there was Paint Shop Pro. I always download the latest version and, though I use it infrequently, it does come in handy from time to time. Paint Shop Pro has just gotten better and better over the years, and is an unqualified bargain. Put it on the pay list. Also, a couple of shareware games the kids have enjoyed for years, such as Commander Keen and Cosmo's Adventures. Writing a couple of checks will be a good object lesson for the kids, as will deleting the things that they didn't tell me they'd downloaded and apparently aren't using. Hmm. There's another game they use. Oops, two more.

We're over a hundred bucks now, just on games. This is going to be some object lesson.

Then there are the gray areas within GRAYS. When updating my copy of X10WIN, I found a new program, X10WC (X-10 Windows Control) that I actually like better. I've used it only once, and I haven't converted over to it. Should I switch and pay? Stick with X10WIN and delete it? If it's a keeper I'll probably register on-line, via CompuServe (Go SWREG). If the product is in the shareware database, you simply find it and add in shipping charges; it's billed to your account. Other shareware vendors let you send credit card info via e-mail. Checks in envelopes work fine, too.

So there you have my shades of GRAYS, laid out in black and white. □

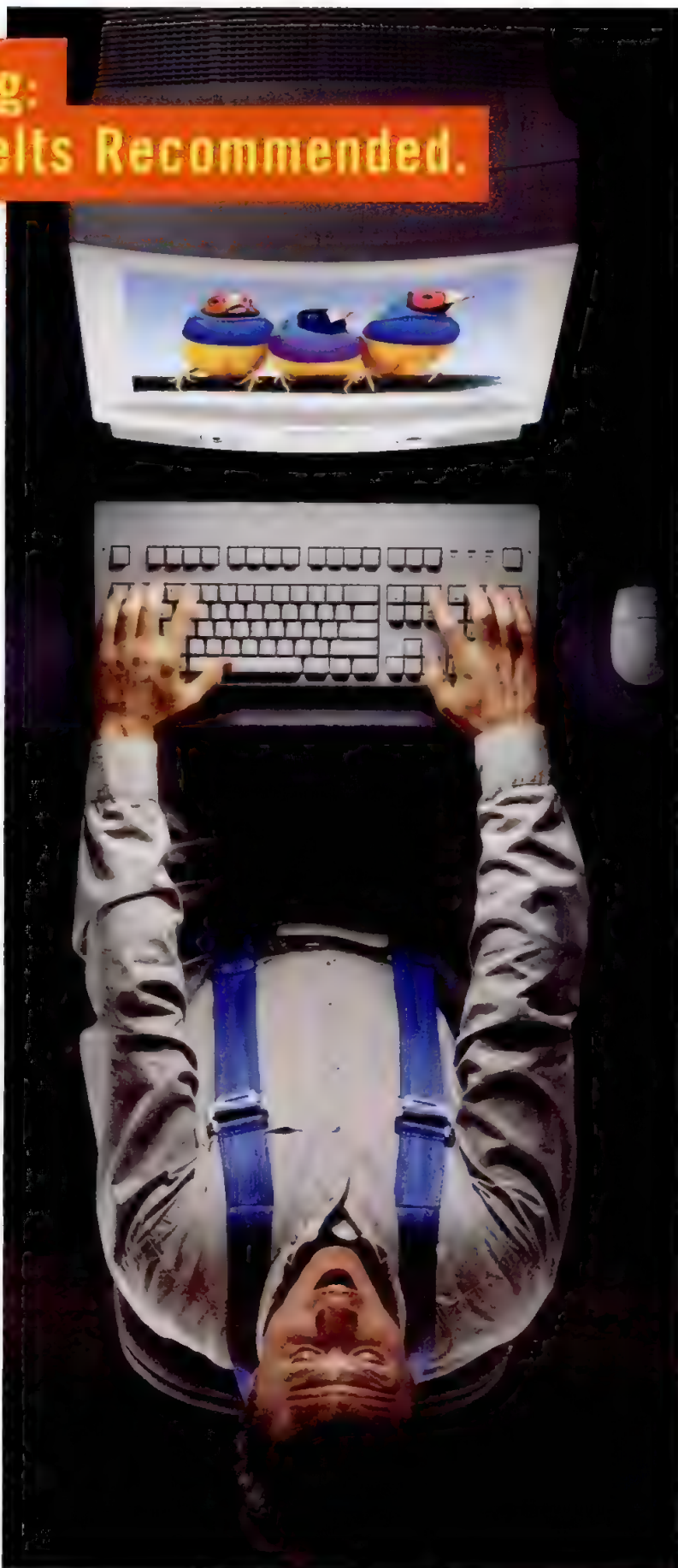


SHAREWARE

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**Warning:
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Second Looks

LIVING WITH THE PRODUCTS WE REVIEW

Windows 95, Take Two

With 7 million or so copies of Windows 95 now in users' hands, the first major bugs are starting to come out of the woodwork. Though Windows 95 advances the state of the art for Object Linking and Embedding (OLE) and networking, these are

creating a file called CS\$, which contains valuable backup information as well as a pointer to the system's hard disk. Any inquiring mind on the network can dig into your hard disk—albeit with read-only access.

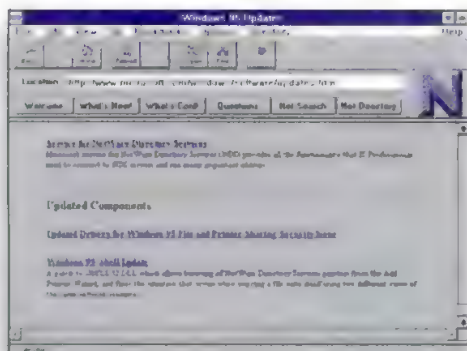
Just as serious is a bug in Microsoft Word 95 that places file fragments in the oddest places. A document with sales quotes that you

thought you had deleted can turn up in an e-mail about accounting practices. Or a letter to a supplier can contain sales-projection information you thought you had deleted.

What's going on? Well, a PC doesn't actually delete data; it just removes the relevant portion of the disk's file-allocation table, leaving the file—or part of it in some cases—intact.

Microsoft's Object Linking and Embedding (OLE) then picks up the fragment and inserts it into an active document.

Patches to keep your hard disk out of reach of prying eyes and to keep OLE under control are available at Microsoft's Web site at <http://www.microsoft.com>.



also some of the operating system's trouble spots.

If you're running Windows 95 on a NetWare network under certain conditions, others in your office can use Windows 95's remote-administration features to nose around your hard disk and view just about any file. The bug involves Windows 95

BUG BRIEFS

PROBLEM

Intel-made Pentium PCs using IBM's OS/2 Warp and the PC Tech RZ1000 PCI/IDE controller chip can have **read-write conflicts** during normal operation, resulting in random data errors and lock-ups.

SOLUTION

Either **disable the prefetch buffers** on the PCI/IDE controller or **use the patch that's available from IBM's Web page** at <http://www.ibm.com>.

PROBLEM

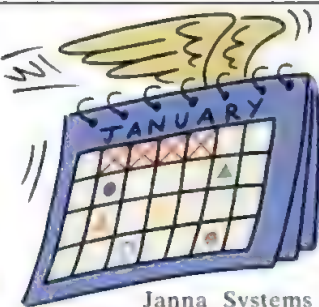
Several users of Hewlett-Packard Pavilion PCs have reported the **disappearance of icons** from the control panel when they use the HP Personal Page feature.

SOLUTION

According to HP, this is not really a bug but a way of hiding some of the complexity of the interface. However, HP has written a **patch to resurface the lost icons**. It's available from the company's Web page at <http://www.hp.com>.

Janna Contact Speeds Up

When we reviewed Janna Contact 95 (First Looks, November 21, 1995), we were impressed with this contact manager's extensive integration with Microsoft Office 95 but disappointed at its performance. If you have to wait several seconds for a calendar to show changes or a contact record to appear on the screen, it may not be worth the effort.



Janna Systems has updated Contact 95 with an eye toward speeding up key activities. The maintenance release streamlines and optimizes behind-the-scenes operations of the underlying Microsoft Jet Database. For example, with the maintenance release you can get to the main contact screen in about half the time it previously took. You can expect similar speed gains in scrolling, opening contact lists, and switching among records.

LOOKING AHEAD

Tell me what you love and hate about these products and we'll share the information in future issues.

Color ink jet printers	PC Card modems
Digital cameras	Quad-speed CD-ROM drives
Multifunction peripherals	Remove-IT 2.0
LANtastic for OS/2	WordPerfect 8.1
Lotus Organizer 2.0	ZDS 2-NetFlux

Janna engineers have also taken this opportunity to fix a number of minor and major bugs, such as the program's tendency to print the occasional blank page. The company has also fixed some import problems, such as the skipping of some records when importing data. A new import wizard brings ACT data into Janna Contact 95, and you can now transfer notes between the two programs, a task that has always been a pesky problem.

The two-disk fix, which takes about 5 minutes to install, is available from Janna directly or from its Web page at <http://www.janna.com> or from its CompuServe forum.

How to contact Second Looks: Contact Brian Nadel directly via MCI Mail at Bnadel (556-1500) or via CompuServe (72241.1616). You can also find us in the World-Wide Web at <http://www.pcmag.com>.

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8MB System RAM
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850MB Hard Disk Drive
PCI Enhanced Local Bus IDE
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Another Turkey of an Idea

It's inbred thinking. The same bunch of people go to the same conferences with their same friends and see the same demos and hear the same sales pitch and come out thinking the same thoughts. Their thinking is further reinforced as the same people

boost and promote what they have heard amongst themselves. The laughable pen-based computer fad began this way, as did palmtop computing, set-top boxes, and the PIM revolution that brought us the now-defunct Lotus Agenda and Symantec Grandview. Well, these people are at it again.

This time the hot topic is the so-called Web terminal. Believe me, this idea will go down as the turkey of the decade.

With most of these bad ideas, there is a slew of brand-name boosters. Larry Ellison of Oracle leads the pack, along with Scott McNealy of Sun Microsystems and a bevy of prognosticators including Bob Metcalfe. They should know better. It seems that the buzz was boosted to the max at Agenda, one of those expensive computer events mentioned above. Participants there were cheering because these minimalist systems buck Microsoft. Developing technology just to be anti-Microsoft is counterproductive, but hey, it's not my money.

Anyway, the Web terminal stems from a number of mistaken ideas and is terribly retro. Expected to sell for \$300 or so, it's supposed to open the World-Wide Web to even more people. I'm sure it would do that, but do these jokers think that's what people want? Folks, this is basically a diskless terminal, the same device we ditched a decade or more ago. Why bring it back? Oh yes, because it's only \$300. For you? \$299.

Who's going to make this lemon? Sun Microsystems? Toshiba? The laptop makers have been fighting an uphill battle getting people to buy laptop systems sans floppy disk drives. At least the laptop has a mighty hard disk and is a real computer. These Web terminals are just memory and display. Have any of these people ever gone on the Internet? What good is finding a resource if you can't download the files? Obviously newsgroups are out. "Well, you can print the Web page directly on the printer," the boosters will argue. Gee, add at least \$400 for a color printer.

Of course, and as long as we want to be retro, let's not ignore the schemes to turn our TV sets into Web viewers. Shades of the Apple II and the Commodore 64. One guy is

proposing a box that takes the Web down from a cable and uses a 14.4-Kbps modem to send requests upstream over the phone as the pages are blown onto the family TV. Like people think this is a good idea? "Mommy, Daddy has those gross pictures on the TV screen again."

By far the most ludicrous assertion regarding this terminal concept is the assumption that people will use these terminals to run applications (somehow) off the Web. Who are we kidding? The Web is a page server. Can we find a more inefficient way of doing things? Where is the secure storage for the files of these apps? In Larry Ellison's Oracle database server in Mountain View? I think not.

People want personal computers. It's a trend that began in 1976 and is not turning back to terminals or minicomputers or anything like that. In case you haven't noticed, people like having their own hard disk and their own floppy disk and, if possible, their own printer. Is this difficult to understand? People prefer a car to public transportation.

The PC can be used for all sorts of things. Developing a Web terminal in hopes of untracking Bill Gates (which—I repeat—is the real motivation here) is a monstrous joke that will keep us all laughing for years. It's as if someone tried to develop a spreadsheet computer or a word processing computer. Actually, the word processing computer was available and was killed off by the PC. The beauty of the PC is its versatility.

This reinvention of the smart terminal under the guise of a Web-oriented specialty device will fool nobody. The real dreamers are those who think the family TV, which is also under attack by Nintendo, Sega, Sony, and others, will be subverted into a Web surfer.

Unfortunately, the inbred thinkers in this industry will be singing praises for this latest concept over the next few years. A lot of people will lose a lot of money and then blame someone else for the stupidity of following this path. Luckily, the computer-using public won't need these devices anyway. But if your Mom starts asking you about it, tell her to get a real computer.



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Worst-Case Scenario
Dept.: Until now, I've avoided addressing a key question that I once thought was silly: Will the Internet become the equivalent of the CB radio fad of the 1990s? I've avoided it because I thought the parallels weren't sufficient. I've changed my mind. The possibility does exist, and the repercussions would be horrendous.

Here are some **troubling aspects** of the Internet's development that I've recently noticed:

- **Excessive media coverage.** Most stories in the computer trade publications are about the Internet or about products for the Internet. Many of these products are of dubious value, but this is rarely, if ever, explored. Cyberspace boosterism reigns.
- **Excessive P/E ratios.** Publicly held companies selling Internet-related anything are immensely overvalued. The incredible price for a share of Netscape is but one example among many.
- **Net newbies, know-nothings, and the clueless in charge.** This is frightening. Almost everyone I've run into who is running a Web site or doing "something cool" with the Internet discovered it within the last year, has little telecommunications experience, and knows almost nothing about computing in general. Now, they are experts. While there is nothing wrong with naive exuberance and a go-getter attitude, it does feed a frenzy. Also, quality suffers.
- **Promises that cannot be fulfilled.** The biggest hype of late surrounds @Home and the cable modem scene, which promises to de-bottleneck the World-Wide Web. The fact is that most of the Web servers will not cough out the data fast enough, and they themselves are the bottleneck. This is **worsened** by schemes to add real-time video and audio to the Internet, which will further clog the network if it becomes successful.

I've watched people with T-1 lines wait excessively long periods for their in-house service to load on the system. Will users put up with endless "Contacting Site" messages in wait mode and far too many out-of-service conditions for Web sites they need to see? This is exacerbated by **incompetent systems administrators** who cannot maintain their sites properly. We've all had ridiculous experiences with sites that simply don't work. @Home and others promise they'll cache the top 100 sites for better access, but with over 100,000 sites and counting, this won't be enough.

• **The fickle public.** Is it possible that a lot of people will simply lose interest in the Internet in general and the Web in particular? There always seems to be some new and potentially exciting site that, once you get there, turns out to be just another place selling T-shirts. How long will people

*Will the Internet
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 become the CB radio
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 The possibility
 does exist,
 and the repercussions
 would be horrendous.*

stay interested once they sense a never-ending futility?

• **Over-expansion of on-line services.** Old-timers have noticed that CompuServe used to be a stable on-line service and kind of stuck at about 600,000 users. Suddenly all the on-line services have shot into the 3-million-subscriber range, and all are doing heavy TV advertising on top of it to get even more subscribers. Has anyone thought that this amazing overnight jump was a little peculiar? These services all promise Internet access, but none are efficient.

The two boom-and-bust cycles that need to be examined in regard to the Internet are the CB phenomenon of the 1970s and the Atari 2600 game bust of the 1980s. The CB phenomenon died almost overnight as

the system was expanded to include single-side band channels to help alleviate the clogged main channels—which **were filled with kids cussing over the air and giggling.** During its peak, there were hit records and movies about the culture that formed around CB. CB still lives, but it's hardly a mania. A definitive study on this phenomenon is needed.

The other boom/bust that needs careful attention is the overnight **collapse of the Atari 2600 video game market.** One bad market report came in one day, and the next day the scene died after an amazing run of success. It was such a frightening collapse that American companies shied away from video games to an extent that the Japanese walked in and took it over.

During a boom, the likelihood of a bust is **never imagined** and the possibility of a bust is **seldom predicted.** Much of the boom and the bust is psychological. When something is perceived by Wall Street and the public as "hot," everyone flocks to check it out and **join the frenzy.** When a bust occurs, the opposite happens. The irony is that the original appeal of the phenomenon may still exist after the bust. Still, it's dead.

All I know is that I personally feel more comfortable about a scene when the growth is constant and sure, as is the case with the personal computer revolution in general. Networking, multimedia, and even operating-system evolution are steady and show no indications of faddishness or of slowing down their growth. The Internet, which is nothing new, became the **hot ticket** when Al Gore promoted the term *information superhighway.* The **craziness went ballistic** when the World-Wide Web became the in thing among the trendies. While the Internet isn't going to disappear in any boom-bust scenario, it may become more normalized and sane.

Whatever the case, this nuttiness cannot continue forever. □

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Actual Viewing Diag.	16.0"
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PC Gifts from St. Nick's Own Stash

Last-minute Christmas shopping. Office parties. Your 37th *Nutcracker* in 43 years. Gloppy weather. The year-end crunch at the office. Panhandlers wearing Santa hats. And joys yet to come: great slabs of utterly inedible fruitcake, arrayed on your

plate at the required appearances at six more Christmas parties, plus the burnt-chestnuts smell, eggnog out of a carton, and salty-sweet baked ham at that annual big production, Family Dinner. Humbug, indeed.

If the pace of this joyous but too-often manic season hasn't completely dimmed your Christmas spirit, and if you still have a few bucks of more-or-less disposable income remaining, consider my annual Last-Minute Shopper's List of Things Computerish which would make dandy presents for those enlightened souls around you who use PCs. Or, in a moment of self-realization, for yourself.

The season's Hot Pick: Snappy. You know you need stills captured from video displays—from your own home videos, from your favorite flicks, from MTV, from *ER* or *Murder One* or *Seinfeld*. Exactly why do you need them? Don't ask me. Windows wallpaper, maybe. How about Peter Jennings' stern-yet-reassuring visage staring at you from behind an Excel window? Or Noah Wyle, grinning broadly in full *ER* regalia? Or maybe color snaps from your family videos to send to far-flung aunts and uncles? I dunno. But the minute you see Snappy, you're going to know you need video caps.

Snappy is one of the truly Cool Tools of 1995. A slim handful that plugs into a parallel port and throws up a funky but appropriate interface, Snappy produces the damndest video caps you've ever seen. Sharp, long-scale, 24-bit color, amazingly nonblurry. Easier than you'd believe possible. The secret lies in Snappy's silicon: Its HD-1500 video-digitizing chip delivers the highest-res video captures ever—up to a wretchedly excessive 1,500 lines per inch. With a sub-\$200 street price, Snappy is one of the great bargains in PC-dom this year.

You won't admit that you're going to use Snappy for grabbing wallpaper stills or for capturing family snapshots from your videos, of course. You'll talk about grabbing frames for PowerPoint presentations to orient new employees, about grabbing video stills for client presentations, training manuals, and new-business proposals. Uh-huh. Surre.

Two cool, new pointing devices from Microsoft: for little kids, the EasyBall; for big kids, the SideWinder 3D Pro joystick. The EasyBall is a weird and wonderful hold-it-in-your-lap trackball, made for kids from about two through six years old. You grab either of the two flange-like grips on its sides

and roll an absolutely enormous yellow ball in the center for cursor positioning. It's far easier for little kids to use than any other pointing device I've seen, and you also get a nifty Explorapedia CD-ROM in the bargain. Highly recommended, Mom and Dad.

The SideWinder is for the aggressor in you—which means, it occurs to me, that it might be absolutely therapeutic after a bout of late-night Christmas shopping. It's one of the best joysticks I've used, with all the buttons and gimmicks we've gotten used to. In addition to emulating Flightsticks and ThrustMasters—the gonzo game-players' weapons-control systems of choice—it gives true 3-D control, so it's a gas with the new Win 95 games. Try it with Microsoft's new *Fury* (not in the box, unfortunately), and you'll find it hard to go back to Flatland. The EasyBall and the SideWinder are each \$60.

Speaking of new CD-ROMs, don't miss Virgin's new *TriTryst* (\$25), the Next Thing for Tetris fanatics. You'll go crazy trying to get the right-color jewels lined up—especially since the ones you need keep mysteriously disappearing just as you go for them. But hey, going crazy's the idea here, right? Look for *Passage* to

Vietnam, too, the latest CD-ROM from the Day-in-the-Life Guy, Rick Smolan. Whatever your memories of Vietnam past or thoughts on Vietnam present, I guarantee that you'll be moved by this haunting evocation of that beautiful country. Especially enjoyable for photographers who have fantasized about joining Smolan's *DITL* crews as they blitz a country, this \$40 title from Broderbund is a must.

Echo Lake (\$50, Delrina) has been out for a few months, so it doesn't qualify as absolutely new. But it's still fresh and surprising, a unique way of pulling your family's history together into a record. Finally, map buffs should track down a copy of the new *Encarta Atlas* (\$55, Micro-



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My annual
Last-Minute
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for those souls
who use PCs.

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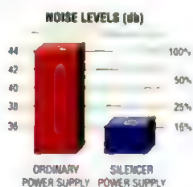


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"Power supplies you can barely hear" *PC World*, July 1993

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soft), the best of the new CD-ROM atlases. It's a perfect adjunct to Microsoft's Encarta '96 (which, also at \$55, remains the class act among computer encyclopedias), or to any other CD-ROM reference work, for that matter. (Unfortunately, Encarta Atlas is a Windows 95-only disk.)

Micrografx's \$50 Hallmark Connections Card Studio is my pick for the consumer software product of the year. In tandem with a color printer, it turns out Hallmark cards, both traditional and semihip, from over 1,000 designs and texts. (Tip: If you can, dump the whole 50MB CD-ROM to your hard disk; the speed increase is wonderful.)

Shoot a lot of photos? I've written before about Storm's \$200 EasyPhoto Reader bundle: a small color scanner for 4- by 6-inch snaps, with EasyPhoto image-editing software. If you got a new color ink jet printer this year and don't have an EasyPhoto kit, you're missing a lot of fun. You'll be amazed how good your photos look rolling off the ink jet.

My pick for hardware product of the year, period, is Hewlett-Packard's new, under-\$1,000 CD-ROM reader/writer, the SureStore CD-Writer 4020i. (HP does a lot better with products than product names.) It's a quad-speed reader that also writes at double-speed; it's quick and easy to install and even quicker and easier to use, thanks to the very good EZ-CD bundled software. You even get a fast, bus-mastering SCSI-2 controller card for the 4020i, free in the box (which is essential, in my experience, and beats trying to run *any* CD-R off the same SCSI card that controls your hard disk).

Sure, you can use the 4020i for hard-disk backups, taking multimedia presentations on the road (and sharing them with others) and archiving seldom-used files. But I'll bet what really gets you about the unit is how easy it is to make your own compilation disks of favorite tunes from your library of audio CDs, for use in the car or in a Discman when you're jogging. You'll see more on this genuinely revolutionary product in an upcoming column; consider this a sneak preview for the last-minute shopper.

Ho-ho-ho time now: With your bag of digital goodies filled, turn off the power switch, sit back, listen to the sleigh bells and carollers, and relax. Remember what Christmas is all about—and as important, that the frenzy of the past few weeks is *not* what it's about.

And lay off that fruitcake, huh? □

PC Predictions for '96

We all know PCs will get faster and cheaper in 1996, and they'll probably become a bit easier to use. And we know that Intel and Microsoft will build market share. You don't need Jeane Dixon to tell you that. Here are ten less obvious developments

I see for the industry in the coming year.

- **New storage solutions.** Most likely, you'll see PCs with a traditional hard disk and a secondary, removable mass storage device. I like Pinnacle's 4.6GB Apex magneto-optical drive, the wildly successful 100MB Iomega Zip drive, and the Panasonic PowerDrive2 two-in-one,

read/write 650MB optical/CD-ROM drive. CD recorders are fascinating, but they're not for every desktop. The high-density CD drives we'll see at the end of 1996 are incredibly important to PCs for their 5GB-plus storage capacity; as video players in the consumer market they'll become what the laserdisk was (high-res)—and what it never was (popular).

- **Swan song for high-priced portables.** IBM builds great notebooks but, at \$8,000 for the top-of-the-line ThinkPad, there won't be many takers, no matter how much technology they pack inside. The sweet spot of the market is \$2,500 to \$3,000. That's where Toshiba is cleaning up and IBM is headed, finally.

- **Ditto for cramped keyboards.** Floppyless subnotebooks typically had scrunched keyboards. Now, computer makers are reversing direction, designing wider but thinner cases to accommodate bigger screens. So, standard 19-millimeter key spacing won't be a problem anymore. That probably spells the demise of IBM's innovative butterfly folding keyboard, a *tour de force* that unfurled its wings two years too late.

- **Cheaper edutainment software.** As home consumers continue to snap up multimedia PCs in massive numbers, you'll see more home entertainment and educational software priced at \$20 to \$30. At that price, it's an impulse buy. Major reference works can cost a little more. But Encyclopaedia Britannica Inc.—“Earth to Britannica, come in please”—is in for a rude awakening if it thinks it's going to sell Britannica CDs at \$995 a pop. Hollywood learned five years ago you make more money selling ten videocassettes at \$19.95 than one at \$99.95.

- **Multifunction peripherals (MFPs) take off at home.** In upscale homes and SOHOs that need fax capabilities, versatile all-in-one printer/copier/scanner/fax machines will sell well.

The reason is simple: Fax machines always work, unlike PC-based fax modems, and MFPs are more like fax machines than PC fax boards. The MFP you want has four-color (CMYK) color capability. Nobody has one...yet.

- **MPEG-II: Coming to a desktop near you.** MPEG-I really should have been called MPEG one-half; it's only partway there. What you want is full-screen, full-motion video that you can play back *and* that you can capture (record) in real time. PCs still aren't up to that today, but it's just a matter of time.

- **OS/Who? IBM's OS/2 packs it in.** All the things IBM has done in the last decade that end in S/2—PS/2, OS/2—aren't working out. The handwriting is on the wall for OS/2, and maybe by 1996 Big Blue will have an OCR engine capable of reading what it says: “Technically advanced products don't always win out.” The fat lady has sung.

- **USB wins big.** Universal Serial Bus will let you attach lots of peripherals to your PC. The phone plug-size connector is a boon if you're the type who uses hand scanners and label printers or if you want an adult keyboard and mouse and a kids' keyboard and trackball attached all at once at home. It's the one thing I want most on my next PC.

- **Electronic commerce looms.** But not in 1996. Eventually we'll solve the serious problems, such as the security of your credit card number on-line, and the minor ones, such as the five business days it takes to post an electronic check payment. The

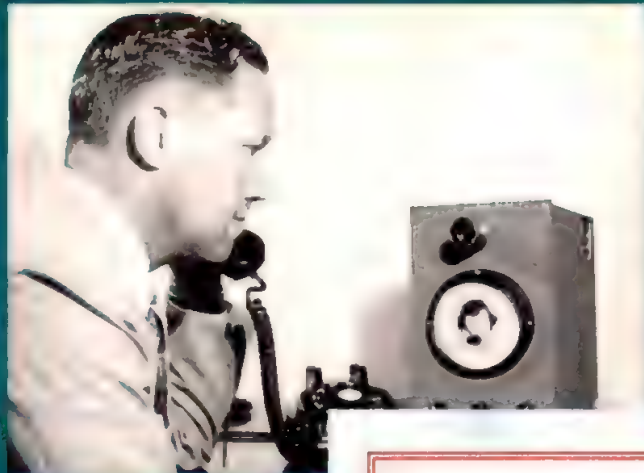
government is worried electronic commerce can be made untraceable, which is both bad news (now everyone, not just the drug cartels, can move money to Swiss bank accounts) and great news (at last, true personal privacy).

- **On-line and the Internet: much light, some heat.** It's an enormous time sink. And it's immensely valuable. There's still a lot of growing to do. Big problem with the Internet: Just because it's posted doesn't mean it's true. Big problem with on-line services: It's silly that you should pay \$5 to download a year-old article from a magazine that cost \$4.95 on the newsstand. And yes, we're as guilty of that as everyone else. □



ADIOS OS/2

The writing is on the wall; by 1996 Big Blue may have an OCR engine capable of reading it.



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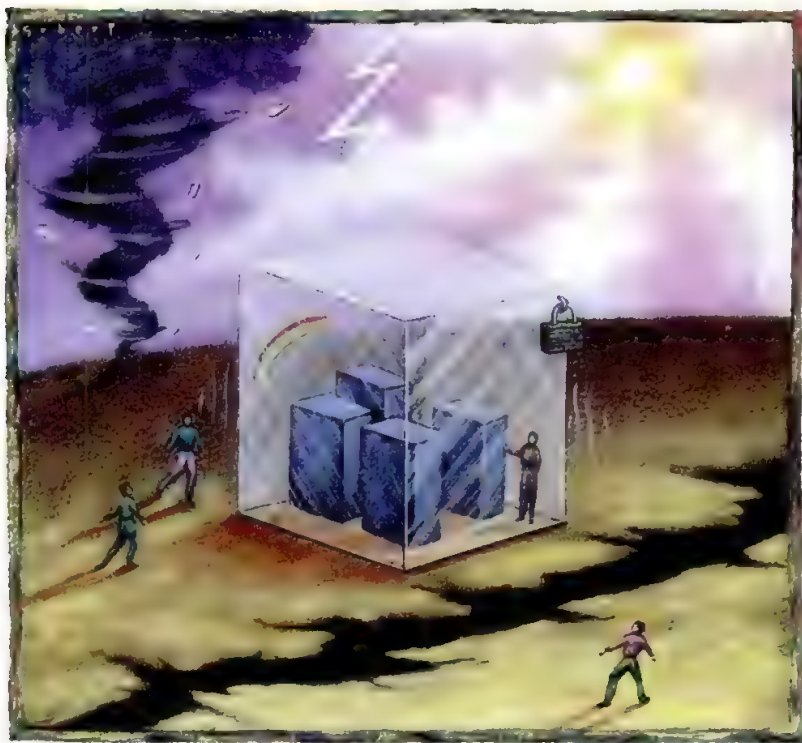
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SERVERS

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Are your servers critical to your business? Then you'd better show them some respect. Build them a great server room.



By Padraic Boyle

The explosion in distributed applications has sparked a proliferation of powerful PC servers and low-cost networking solutions. Every day, large businesses trade in their mainframes and minicomputers for smaller, more flexible PC-based networks. Small and medium-size businesses build their information infrastructures piece by piece, sometimes from the ground up. No matter which scenario you fit into, proper planning for upgrading or designing a state-of-the-art computer network is essential.

Illustration by Warren Gebert

INSIDE



Are you considering a move to Notes or another server-based messaging system? Planning to move users off outdated minicomputers to sophisticated apps on the latest Pentium Pro systems? Maybe you already run a big, distributed database, but you live in fear for your PC servers, because they're sitting in a space that used to be the mail room. That's not good, but you're not alone.

SPENDING CAPITAL TO BUILD a server room is an idea the PC world is still getting used to. Though even a great server room may not protect against, say, a tornado, it can prevent a lot of damage.

THINK OF IT AS INSURANCE (you can enjoy hating the premium—as long as you pay it). You shouldn't try to maintain a powerful client/server environment unless you're also willing to establish a reliable physical environment for your servers.

CONTRIBUTING EDITOR PADRAIC Boyle, who knows his way around a corporate server room, steps us through a model building plan. He offers insights into server room issues you might not have thought of. Perhaps you can't do it all at once, but anything you can build in is better and will cost less in the long run.

IF YOU'RE ADDING a Windows NT server to your NetWare LAN, you can ease the transition with a new product we review in First Looks. Contributing editor Steve Rigney says Microsoft File and Print Services for NetWare integrates the server without making you install extra client drivers. (Page NE21.)

AND REVIEWER ARUN DESAI reports on Meridian Data's CD Net for Windows NT. This product enhances Windows NT's built-in CD-ROM sharing by allowing volume grouping of CD-ROMs. (Page NE22.)

—Gail Shaffer

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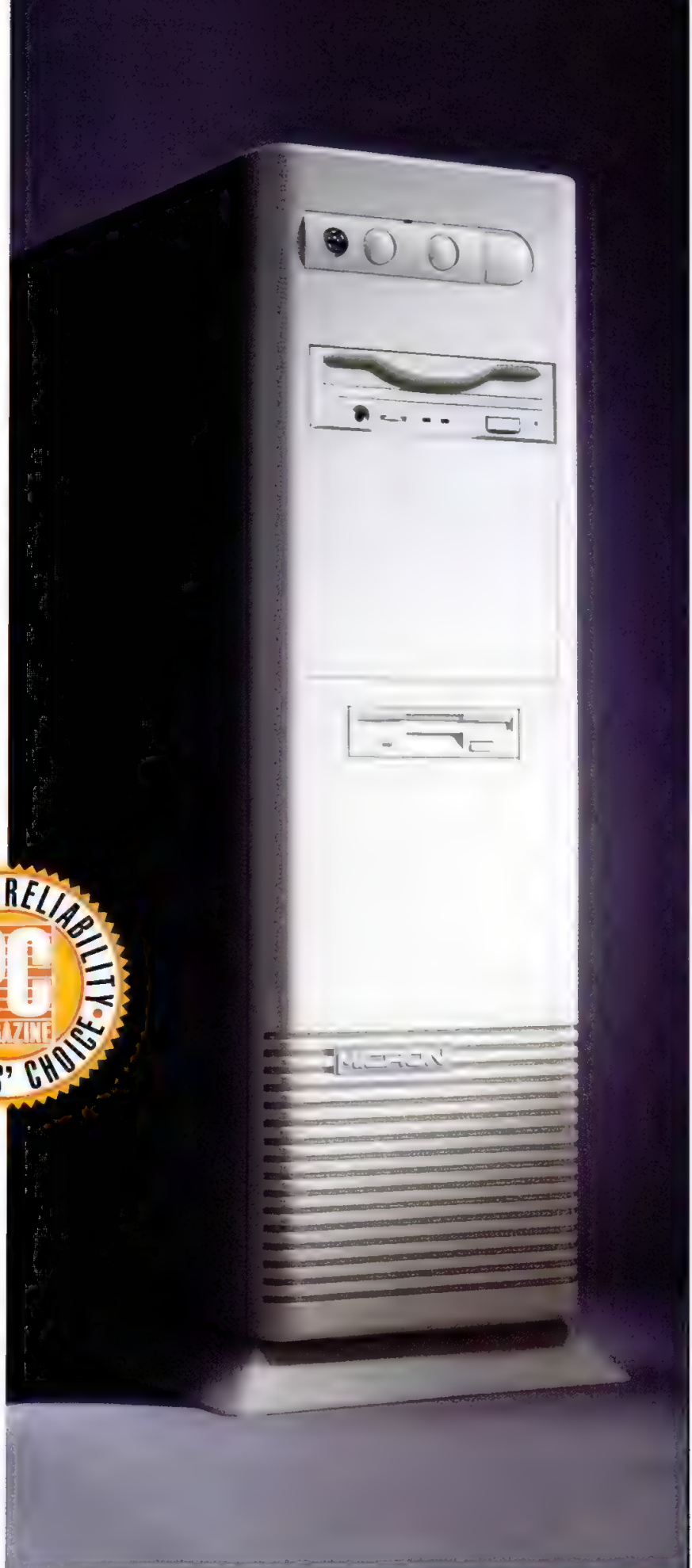
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—*PC Magazine*, January 10, 1995

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CIRCLE 924 ON READER SERVICE CARD

Cable Kismet

Paying careful attention to your cable plant is nearly as important as planning a great server room. By some estimates, 70 percent of network problems are attributable to cabling snafus of one kind or another.

Fortunately, your range of solutions has never been better than it is now. Significant advances in cabling and related equipment mean you can offer high-speed connectivity all the way to the desktop, if you need to. Category 5 UTP cable (Cat 5) can handle 100Base-T as well as ATM, FDDI, and 100VG-AnyLAN. The only limiting factors for Cat 5 are distance and interference. Fiber-optic cabling can connect at longer distances and through areas of high interference, but it costs more.

For best results with Cat 5, make sure each of your components is certified for this quality of wire. Everything—the patch cable connecting the network adapter with the wall jack, the cable in the wall connecting to the patch panel in the wire closet, the patch cable connecting to the wiring hub in the wire closet—must be Cat 5—certified for your system to work properly. Lower-speed topologies such as 4-Mbps Token-Ring or 10Base-T may be forgiving, but that's not so with ATM, 100Base-T, and the like.

For your longer runs, between the wire closet and the server room, say, or between hubs, fiber-optic cable is ideal and worth paying a premium. Fiber is also a better solution for connecting the distant client in the basement.

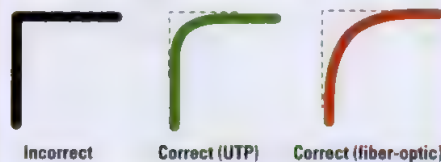
One of the most important pieces of the puzzle actually has been around for decades: the computer room, now called the server room. Most mainframe shops already have them, although they probably need to be retrofitted for the latest generation of computer-technology equipment, as we'll explain. Moreover, in the last decade or so we've seen remarkable improvements in server-room technology.

For the most part, though, you'll still find file servers distributed around offices in small closets, with little thought given to security or proper ventilation or catastrophe. Worse, many of these servers are not just for file and print services, as in the past. They're serving up mission-critical functions—everything from groupware to shared applications to corporate e-mail.

In addition, most businesses end up needing multiple servers. A company with 1,000 employees has, on the average, 50 to 70 servers. That's not counting the additional gateways and other specialty servers, such as those dedicated to Lotus Notes or remote access or other, more exotic, jobs.

Smooth Curves

Cable bends should have radii no less than 4 times the cable's outer diameter for UTP wiring and 10 times for fiber cable



Hand-held cable scanners are a godsend for both existing and new LAN installations. These cable testers can capture practically any cable problem that arises, well beyond reversed pairs (one of the most common problems, yet one of the most easily tracked down) and damaged cable.

Essentially, hand-held scanners inform you about the health of your network cabling from end to end. Information regarding attenuation, cable length, near-end crosstalk (NEXT), network traffic, and signal-to-noise ratio (SNR) can be tracked. Many products, such as MicroTest's Compas (\$4,995), can even connect to a NetWare server as a user. Some can also analyze network traffic. Hand-held scanners are portable, weigh around 3 to 7 pounds, and cost between \$3,000 and \$10,000.

Finally, take care when your cable is installed. Although each cable is flexible enough to be tied into a knot, *don't do it*. Both UTP and fiber are limited by a "gentle curve" specification (see "Smooth Curves"). Also, do not wrap cables around a ceiling-support hanger to secure them. Keep the wires straight and use wire ties if securing is necessary. Cable trays will also help sustain cable quality.

The morals of the story: For new cable installations, Cat 5 and fiber are the way to go. Use only certified cabling. Purchase a cable scanner to test out the installation. And last, but not least, plan for the future—always, always pull plenty of cable.—PB

Today's communications requirements have increased, and gotten trickier, too. Dedicated T1, Switched-56, and dial-up lines between main offices and remote locations generally fall into the realm of the server room. Routers and X.25 switches make their home right next to the other information subsidies.

Just remember that the server room's primary function is to house critical computer equipment in a centrally located, climate-controlled, secure environment that services the data-processing needs of an organization. It may sound obvious, but you'll do well to keep this thought central as you design your server room. You must think about what is right for your installation—avoid overkill if you can—but you must plan for the future as well.

Security, wiring, fire protection, and cooling systems have come a long way in recent years. In this article, we'll touch on all the important issues you need to think about in building a great server room. Remember, though, that the design and implementation of a good server room will almost always require the assistance of an

architect, mechanical and electrical engineers, and a general contractor.

LOCATION, LOCATION, LOCATION

After sitting down and discussing the physical attributes of the server room with an architect, you must decide on its location. As with any type of real estate, location is important. Try to locate your server room centrally. In an office building with several floors, choose the most central floor possible. This will save you cabling costs.

In a campus or metropolitan area network (MAN) environment, consider the building with the most space so that you can design a server room with future expansion in mind. You should plan for five to ten years down the road. This is a big investment—one you don't want to outgrow too soon.

Another item to consider in locating the room is security. Place the server room in an area with the least employee traffic. Consider adding other security devices such as key-card locks and cameras.

Finally, there are a few things you

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Native Oracle™ & SQL Server interfaces	Yes*	No
True object-oriented code reusability	Yes	No
OCX and OLE 2 support	Yes	Yes
Multipatform: Windows, Macintosh OS 2**	Yes	No

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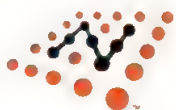


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should avoid outright. For one, don't position the room near windows. They can leak during storms, they add unnecessary heat when the sun's out, and they're a possible security breach. Also, don't place it in an area with water pipes, either above or below the floor. This is another potential hazard you should simply avoid.

THE BIG CHILL-OUT

One of the worst feelings for a network manager is grabbing the *hot* door knob to the server room first thing in the morning, opening the door, and being thrown back by a wall of heat: The air-conditioning went down overnight or over the weekend.

Your critical applications servers sit quietly with blank screens as you frantically check for a pulse. They've gone into a deep sleep. Eventually, you prop open the door, exposing the situation to worried employees as you set fans around the room, trying to bring down the temperature. Not the

You should plan for five to ten years down the road. A new server room is a big investment—one you don't want to outgrow too soon.

best way to start your day.

A superior air-conditioning (A/C) plan is probably the single most important thing you need to implement. Heat has become a major factor as more and more servers are being centralized.

Computer equipment works best when it is kept cool and does not experience ex-

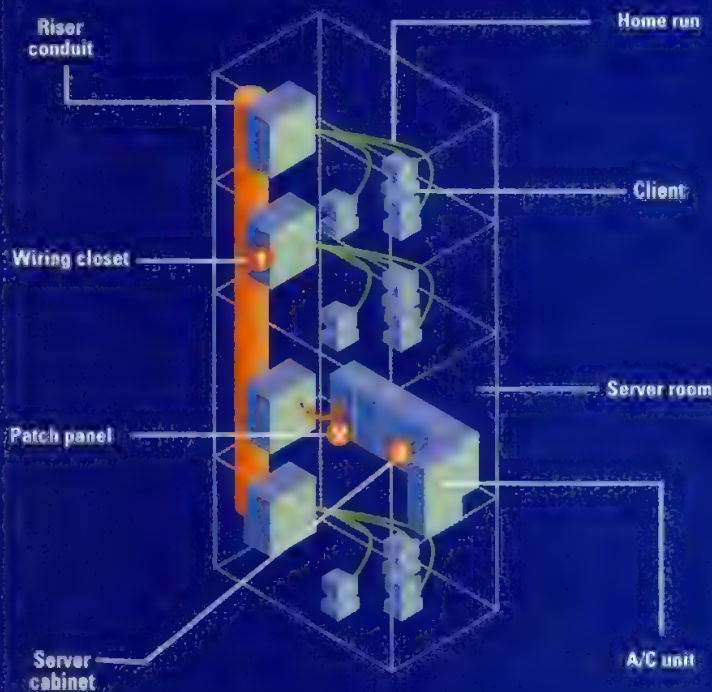
treme temperature fluctuations. The normal sine curve of heating and cooling is plus or minus 2 degrees, and 68 to 70 degrees Fahrenheit is a comfortable temperature. The more important setting on your A/C unit is the humidity. We suggest you set it at 35 to 45 percent. Several companies, such as Cincinnati Network Products (513-661-3510), put out heat-sensor devices that alert you remotely about the temperature in your server room.

When your A/C fails, it's not just an initial overheating that's a problem. When heat causes servers and other equipment to shut down, it can result in future intermittent failures. Your MTBF (mean time between failures) will decrease.

All A/C units carry a BTU (British thermal unit) rating, which tells you the amount of cubic feet an air conditioner can cool. But remember that server equipment produces heat, so you must factor in the amount of heat being gener-

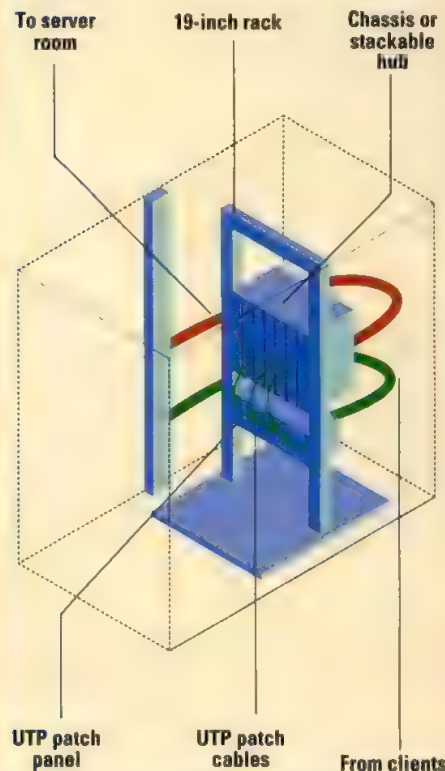
Networked Office Building

Clients on each floor connect to a patch panel in the wiring closet, which links them to a chassis or stackable hub. A fiber-optic cable connects down from the hub to another patch panel in the server room. This panel connects the fiber-optic cable to a switch, which then hooks into the servers. The number of additional switches and patch panels needed depends on the number of servers and floors being serviced.



1 Wiring Closet

Cables from clients terminate in the wiring closet, where they connect to a hub. A fiber-optic cable connects the hub to the server room.



ated by the server room and calculate that into your overall air-conditioning needs.

There is no simple formula to determine the right A/C solution for you. It's something you and your engineers must calculate by adding the total output including the server, monitors, and UPS.

We suggest you get familiar with Liebert units, even if they're not what you buy (see our chart, "Where to Go Next"). Liebert is to air conditioners what Hayes has been to modems over the years—something of a standard by which other vendors are gauged. You'll often see specs for air conditioning listed as "Liebert or equal."

You can also note on your building plans the acronym HVAC, for heating, ventilation, and cooling. Engineers and architects use this to mark the spaces necessary for the A/C units and ducts.

Here are several suggestions to consider

when installing air conditioning. First, calculate the maximum amount of equipment that will be in the server room before settling on any A/C system. This includes current equipment and whatever the maximum will be down the line. Second, split the A/C load between two units of equal strength, each of which could cool the entire room on its own if it had to.

Lastly, look into installing a third, stand-by unit that operates independently of the building's cooling system. In the event that the building's cooling tanks fail or are shut down for maintenance reasons without warning, the stand-by unit is there. It should activate automatically when the temperature in the server room rises above a predetermined temperature. The stand-by unit does not have to be able to cool the room on its own for a long time, but it should be able to maintain a comfortable temperature until the main units are restored.

FLOORED BY FLOORING

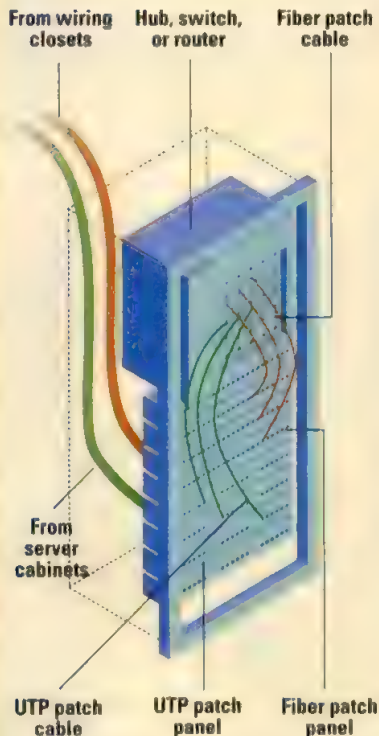
The type of flooring you choose affects the way your cabling plant is distributed as well as how the air-conditioning is circulated in the server room. You've got two basic choices—raised flooring and flat flooring. Both methods have their merits.

Raised computer flooring normally consists of 2-foot by 2-foot panels that sit about 11 inches above a solid concrete floor. The space under these panels can be used for running power and networking cables, and moving A/C throughout the server room. If you do run your cabling under the raised flooring, be sure to use conduits to avoid any obstruction with the air flow. The cabling used in the conduits must have plenum coating (a teflon-like substance), which will limit the conduction of flame and the production of smoke in these small spaces in case of fire.

A choice of flat flooring will mean that you must run cabling overhead or in con-

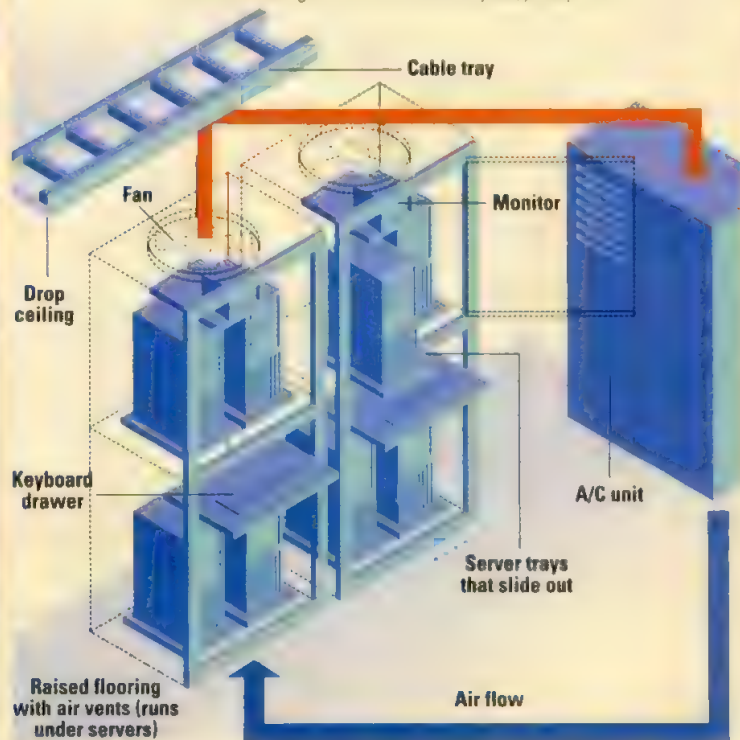
2 Server Room Patch Panel

Cables from wiring closets on each floor and the server cabinets terminate at the server room patch panel.



3 Server Cabinet

Cool air is forced through the space under the raised flooring, which has vented floor panels strategically positioned below the server cabinets. The air passes from the floor vents and over the servers, cooling them. It is then drawn out of the server cabinet by a fan located at the top. As the warmer air rises, it is recirculated back into the air-conditioning units, where it is cooled and sent out once again. This is known as a *push/pull* system.



When we go to work, we work on s
think about switching. When we ta
switching. When we eat dinner, we
about our future, we talk about sw
we go on and on about switching. When



switching. When we eat breakfast, we
take customers to lunch, we talk about
switching. When we talk
about switching. When we talk to our friends,
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Where to Go Next

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Accu-Tech Corp.	770-751-9473	770-475-4659
AMP Inc.	800-522-6752	717-986-7575
Belden Wire & Cable Co.	800-235-3364	317-983-5294
Siecor Corp.	704-327-5000	704-327-5973
Trellis Communications Corp.	603-668-1213	603-668-9211
Patch panels		
MOD-TAP Inc.	508-772-5630	508-772-2011
Hand-held test equipment		
AMP Inc.	800-522-6752	717-986-7575
Fluke Corp.	800-443-5853	206-356-5116
MicroTest Inc.	800-526-9675	602-952-6401
Scope Communications Inc.	508-393-1236	508-393-2213
Siecor Corp.	704-327-5000	704-327-5973
Uninterruptible power supplies		
American Power Conversion	800-877-4080	None
Best Power	800-356-5794, 608-565-7200	608-565-2221
Clary Corp.	800-442-5279, 818-359-4486	818-305-0254
Deltac Electronics Corp.	800-854-2658	None
Exide Electronics Group Inc.	800-554-3448, 919-872-3020	800-753-9433
Tripp Lite	312-329-1601	None
Air-conditioning		
Liebert Corp.	800-877-9222	None

ducts embedded in the floor. Also, the A/C ducts must have sufficient pressure to move the air around to cool all of the equipment. Cabling, however, is not the central issue here: More important is the ability of the cool air to reach the servers and other equipment.

At PC Magazine Labs and at ZD Labs, we opted for a flat-floor design. We needed a solution that could withstand the high volume of people and equipment traffic that flows through both facilities. In our network testing lab, we have enough air-conditioning power to cool an eight-story building, more than the average server room requires, but necessary for our test benches.

WIRE, WIRING, WIRED

By now you've probably been bombarded with enough discussions about cabling types to last you well into the millennium. We'll just recap cable categories briefly, then move into design.

One of the most pervasive cables in use today is Category 3 unshielded twisted-pair (UTP). Although Category 3 is sufficient for 10Base-T and Token-Ring networks, we recommend pulling Category 5 UTP for any new installations. Fast Ethernet and other

high-speed network topologies rely on high-quality Category 5 to produce the most efficient network. If you can afford it, you might also consider pulling extra Category 5 or even fiber at the same time. It's the pulling of cable that costs the most, so why not pull once for the future?

For distributed networks with clients on several different floors, we recommend creating centrally located wiring closets on each floor. Patch panels are useful for terminating large numbers of cables in these closets. The principal advantage patch panels deliver is the ability to accommodate easy adds and changes.

A single cable—known as a home run—from each client is terminated on the wire closet patch panel, then connected to the stackable or chassis-based hub. (See "Networked Office Building.") From there, a fiber or Category 5 cable is installed between the wire closet and the server room. This is a collapsed backbone design. (Be sure to pull multiple cables between the wiring closets and the server room for redundancy.)

The server-room patch panel connects the wires from all the wiring closets. These cables then are connected to a switch or router along with the primary server or servers that service the clients. Proper patch-panel labeling is a must. Separately, the servers also are connected together over their own high-speed backbone, such as ATM or FDDI.

If you're installing a raised floor in the server room, we suggest running all the cabling in overhead cable trays. The cable trays or ladder racks should be installed close to the server cabinets for flexibility. Again, make sure the cabling being used is plenum coated, to limit the conduction of flame and the production of smoke in these small spaces in the event of a fire.

When it comes to wiring, neatness counts. When you're designing your serv-

er room, be sure to keep it simple and maintain proper documentation and schematics of the entire room. Knowing exactly where every cable is coming from and going to makes troubleshooting easier. Keep the wiring data up to date: It's worthless if notes are not accurate and current.

NO ELECTRIC BLUES

Your power system is another important, but widely misunderstood, element in your server room. The heading of *electricity* covers both power and grounding, and grounding is often the more critical of the two. The server room is no place for novices. The subject is so complex that the IEEE has a special publication dedicated to it. Commonly referred to as the "emerald book" for the color of its cover, its actual title is *IEEE Recommended Practice for Powering & Grounding Sensitive Electronic Equipment* (ISBN 1-55937-231-1).

This book clearly describes the problems and physical dangers of various electrical potentials (ground loops) that are possible when many copper cables are together in one place. It discusses important grounding topics, such as establishing a ground for signaling and the problems with single-point ground systems. Although you're not likely to be designing the power or ground systems, this book is a must-have if you're going to be responsible for maintaining these systems.

Securing the electricity to power your server room can be tricky. Check with the electrical engineer and the building supervisor to see if the building's power can accommodate the influx of equipment you plan. You may need to have additional power installed, and that's going to cost extra.

Count the number of servers, monitors, routers, and so on, and calculate the amperage needed to power them all. You must calculate for the servers and equipment that you have and that you may have in the future. The electrical engineer will take care of the necessary power requirements.

After you've installed a proper power and grounding system, you need to plan for backup. You've got two options: battery or generator. Battery backup is available as a UPS (uninterruptible power supply) connected to each server. But that only buys a limited amount of time (about 20 minutes). You could purchase a large room full of batteries that can accommodate the entire server room for several hours. But if you go this route, you must make sure that your holding room has the structural integrity to hold the batteries, which are very heavy. A genera-

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CIRCLE 869 ON READER SERVICE CARD

 **KYOCERA**

tor's backup support, on the other hand, is limited only by the fuel supply.

All UPS companies offer software that works with Microsoft Windows NT, NetWare, and Unix servers and warns the servers that they are running on battery power. You can program the servers to send network notices to each user and to begin a graceful shutdown in the event of power loss.

Prices for UPS systems range from \$350 to \$2,000 per unit, depending on the power-requirement amperage of the server. For many installations, the temporary nature of battery backup is sufficient. For businesses that absolutely, positively must be up and running 24 hours a day, 7 days a week, 52 weeks a year, you can opt to install a generator for about \$250,000. This class of generator is very large and is generally located outside the office building, so be sure you have the real estate.

GUARD DUTY

If you want to sleep at night, then server-room security is a critical detail not to overlook. You've got a lot of choices, but we think key cards in combination with video cameras is probably the best solution.

The key card adds some flexibility by allowing you to program various levels of security access. If, for example, a staff member requires access to the server room during regular business hours but not on weekends, then access can be limited for that particular person's key card. In addition, access can be granted as needed, on a temporary basis. Optionally, you may set up the system so that, after hours, someone must use the key card to exit the facility as well.

Many companies already use video surveillance in corridors and near elevators to protect themselves from would-be thieves. By building video cameras into the server room, you can monitor activity in there at the same time. Try to get cameras with motion detectors.

Finally, just as you've seen in the movies, hand print and optical scanners are available for extremely high-security installations.

THE FIRE DEPARTMENT

Protecting your equipment from theft is one thing, but what about fire? There have been many arguments over which fire-retardation system is the best.

Halon has been the fire-protection chemical of choice in the past but it has come, well, under fire in recent years for possibly causing excessive corrosion of computer components. And it's been banned by the Environmental Protection Agency (EPA). Now Halon has been replaced by new chemical compounds that meet EPA standards and National Fire Protection (NFP) 2001 standards. DuPont's FE-13 is one of these compounds.

For all intents and purposes, NFP 2001-compliant products are flame-retardant gases that choke a fire until it is extinguished. But that's not where the problem ends. If, for example, the fire is not exterminated by the gas, then the flames could return. You'll also need to allow for venting to expel the gas after it is released. The NFP-2001 approach can run around \$20,000 for a normal-sized server room. If you are currently using the old Halon system, by the way, you will have to replace the entire system with one that meets NFP-2001 standards. You can't just swap cylinders.

Standard water-sprinkler systems also can damage equipment—especially badly if the system is triggered by a fire in a remote section of the server room that subsequently causes a flood of the whole server room.

Our first choice is what is called a dry system. In a dry system, you have the same basic components as a regular sprinkler system; at rest, however, the system is full of air rather than water. Smoke alarms are positioned in strategic locations through-

out the server room to get the best coverage possible. In the event that a fire alarm is tripped, water fills the pipes but will not activate the sprinklers immediately. Each sprinkler head is designed to release water only if a glass fire-link bursts as a result of excessive heat caused by a fire.

Equipped with a temperature sensor and self-retracting coils, each sprinkler has the capability to shut itself off automatically when the fire is extinguished and the temperature returns to normal. This not only prevents unnecessary water from entering and destroying the entire server room, but also sprinkles only the areas where the fire was detected.

Moreover, because the sprinkler heads shut themselves down automatically, water release is kept to a minimum. You should have drains installed under the floor to disperse the water so that it causes no further damage.

Your security and alarm systems also must be approved by the local fire department and the building supervisor. Many buildings require that you tie into their systems as well—yet another potential cost. Also, we suggest that your alert system provide notification to multiple users. You should devise a set of procedures laying out exactly what should be done and who is responsible for what in the event an alarm is triggered.

NOT YOUR FATHER'S CABINET

Leaving a server on an open rack or table is just asking for trouble. Unsuspecting visitors can accidentally bump into a power switch or even knock the server over. That's not an easy one to explain to your

end user who just lost the document that he'd been working on all day.

One good way to avoid such hassles is to put the servers into a cabinet. This will not only keep the server from being accidentally shut down, but if the cabinets are designed properly, will add security and additional cooling.

Many generic cab-

inets are available on the market. But the most useful cabinets are usually custom-designed. Features to look for are pull-out server trays, shared keyboard drawers, power and wiring channels, fans for ventilation, and louvered rear doors. And, for

The Right Combination

All server rooms are not alike, but it takes the right investment in each of these areas to make a proper home for your servers.

Lighting



Cooling



Power



Location



Flexible cabling



Security



Placing your servers in a ventilated cabinet protects them from accidental shutdowns and provides added security and cooling.



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NETWORK EDITOR'S COVER STORY

additional security, make sure that the cabinet doors have locks, front and back, to prevent unauthorized access.

One important characteristic to keep in mind when designing your cabinets is ventilation. Proper cabinet design is crucial to air flow as well as usability. All too many cabinets are poorly designed and trap unwanted heat inside, causing premature failures of server equipment.

Air must constantly circulate through a server cabinet for proper cooling to take place. Cooling the server cabinets and the server room is handled by strategically placing floor panels with perforations underneath the server cabinets and in other key areas. Our preference, the installation of overhead wiring trays into a dropped ceiling, ensures proper airflow and offers a flexible environment for moves and expansion purposes.

From top to bottom, the server cabinet should provide the least amount of airflow resistance. Any horizontal objects, such as the monitor and keyboard shelves,

Good lighting makes your server room livable for you. Still, turning lights off at night will save on your electric bill and cut down on heat.

should have as many perforations as possible. A fan at the top of the cabinet (one 10-inch fan or several smaller fans) can create airflow to cool your equipment.

Keyboard and monitor switch boxes, such as those from Cybex Corp. (205-430-4000) and Rose Electronics (800-333-9343), provide easy movement between servers without having to move from monitor to monitor and keyboard to key-

board. The switch boxes save you the hassle of having to know which keyboard or mouse goes with which server, but also save considerable cabinet space and cuts down on heat-emitting monitors.

LIGHTEN UP

If you think lighting in your server room is not all that important, think again. Light quality and positioning play a significant role in creating a comfortable environment in which to work. And there's no reason lights must remain on at all times. For outside of business hours, consider installing a motion sensor that turns the lights on when you enter the server room. This will save on the electric bill and cut down on the heat.

Positioning your lighting is important because of the glare factor. If a fixture is placed directly above a cabinet, it may make it difficult to view the screen. Try to place lights strategically around the room with as little interference with server cabinets as possible.

Soundproofing is a difficult challenge in



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CIRCLE 851 ON READER SERVICE CARD

COVER STORY

a server-room environment—especially when you get up into the 40-or-better number of screaming servers, with other sundry equipment, as well as the air conditioners. It'll be enough to drive you crazy. Some of the more time-proven solutions for reducing noise include dropped ceilings, acoustically padded walls (which also come in handy for banging your head against), and carpeted flooring.

The problem with many of these solutions is dust particles. Servers breathe in everything through their little vents. Thus, the server room should be as spotless as possible. So maybe you want to choose just one of these solutions—shop for the most dust-free. Remember, too, that your server cabinets will lend a hand in the fight against excessive noise.

You are likely to spend a good portion of your day in the server room. If you can design a feature that benefits your servers and also makes for a more comfortable environment, do it. You probably even want to design in space for a couple of workstations.

BRINGIN' IT ALL HOME

We're not going to sugar-coat any of this: Building a server room costs a lot of money. To get an approximate cost on the investment, take the basic price tag of building a standard office space of similar size to your server room and multiply it by 4.

There are plenty of variables to be dealt with that add cost to the job. The fact of the matter is, you can't just go out and do this on your own. You've got building codes that must be complied with, along with certifications to procure. The architect and mechanical and electrical engineers will have to handle many of the design and specifics involving power, A/C, plumbing, and other essentials for you.

Furthermore, you must stay on top of these professionals every step of the way. They might not like it, but it's your server room and your very large investment. Be sure to take copious notes and demand a weekly status meeting with minutes taken. Keep the participating personnel involved and up to date, and ask them for feedback.

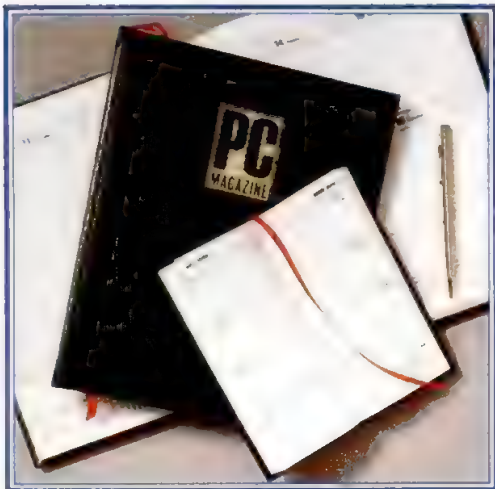
Although the out-of-pocket costs in building a properly designed server room can be quite high, in the long run your investment will pay off in a well-running server room and your peace of mind.

To IS departments, or, more specifically, to network managers, the server room has become something to be protected and taken special care of. Their jobs and their users' jobs rely on the network running at 100 percent all the time. Remember, users do not notice the 364 days that the network is running; they notice only the 1 day of the year that the network is down.

When the actual server room construction is complete, don't be shy about taking it for an immediate test drive. Make sure the A/C backup units are working properly. Double-check the security systems. Look into testing the sprinkler systems with the assistance from the contractors. Check out everything for real *before* you move all of your equipment into its new home. You'll be glad you did. □

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CIRCLE 926 ON READER SERVICE CARD

First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

FILE AND PRINT SERVICES

Microsoft Makes Windows NT Ready-to-NetWare

By Steve Rigney

Having just lived through the holiday season, you may find the joyous nightmare of writing, addressing, and mailing cards is still with you. Relaying the most relevant news is always a challenge, and nothing is more frustrating than sealing the last card, only to recall a titillating bit of gossip that was left out. Although you could open each and every one of your cards to make your addition, wouldn't it be wonderful if you could add what was needed in one simple step from a central location?

When attempting to add a Microsoft Windows NT server to an existing NetWare network, many administrators in NetWare shops face a similar dilemma. How do you add a Windows NT server without installing Windows for Workgroups, Windows 95, or some

other Windows NT client on all the client PCs? Who wants to change client software and install more drivers on the networked PCs that will use up more memory just to add a Windows NT server?

Fortunately, Microsoft has come up with a relatively pain-free solution: Microsoft's File and Print Services for NetWare (FNPW). This product allows your Windows NT server to emulate a NetWare 3.12 file server, so you don't have to deal with making changes on client PCs.

FNPW retails for \$99.95 per server license, and you'll also need a Windows NT Client Access License for each client PC that will access the Windows NT server.

End users' Windows NT servers will appear just like their NetWare 3.x and 4.x file servers. But there are a couple

of drawbacks. You can't load NLMs on your Windows NT server, and FNPW doesn't work with NDS.

FNPW runs as a 32-bit-system Service on any Windows NT server running Version 3.51 or later. And it coexists with the built-in networking functionality in Windows NT, so you won't have to disable the internal network to share files and printers with your NetWare clients.

One of FNPW's best features is the compatibility it has

with different versions of the NetWare shell requester. FNPW works with all versions of Netx and VLMS, so you don't have to worry about upgrading your NetWare client software. For testing, we connected to our Windows NT server using NetWare redirectors Netx, Version 3.26, and VLM, Version 1.2.

Adding the FNPW services to your server using the network utility on the Control Panel takes about 5 minutes.

Continues on page NE30

WINDOWS NT SERVERS

Smoothing Out the Mix

By Todd E. Columb

Mixed messages as well as mixed platforms abound in today's corporate environment. Making sure that communication flow is maintained in spite of the difficulties presented by using mixed platforms in a single setting is a major concern. Fortunately, products like SoftArc's FirstClass Server 3.0 for Windows NT exist to address just such problems.

Previously offered in a Macintosh-only version, the new Windows NT release of FirstClass Server supports enterprise-wide communications while seamlessly connecting users in mixed platform environments.

FirstClass offers a robust groupware platform from a vendor historically known for strong Macintosh-based messaging products. At \$495 for the server plus the first five users and \$395 for each additional group of five users, FirstClass is also competitively priced, even when compared with e-mail-only packages.

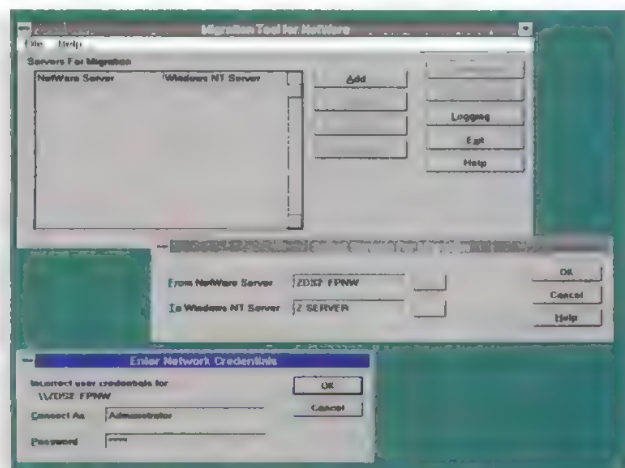
FirstClass provides e-mail, forms processing, group conferencing, and real-time chat for

LAN, WAN, and modem users. In addition, SoftArc and third-party developers offer several add-on gateways to other mail systems, such as cc:Mail and Microsoft Mail. Gateways are also available for Internet connections, faxes, pagers, and SQL or DAL database links.

The Windows NT version of FirstClass can support 250 users simultaneously; this number surpasses the capabilities of the Macintosh version. Windows NT also allows FirstClass to handle an unlimited number of files and over 100,000 user accounts. For remote users, the Windows NT version can support up to 250 modem connections, again surpassing the Macintosh version, which supports only 48.

Multiprotocol support includes AppleTalk, IPX, NetBIOS, and TCP/IP. FirstClass includes a license for IPX, although a license for each additional protocol must be purchased separately.

FirstClass requires a Windows NT 3.5 Server or client with a minimum of 16 MB of RAM and at least 80MB of disk



SMOOTH MOVE: FNPW's migration tool gives you the option of transferring all your NetWare user accounts and resources.

First Looks

space. From a Windows NT standpoint, one of the product's shortcomings is that FirstClass does not run as a Service under Windows NT but as a normal application. This requires the user running the FirstClass server to remain logged on at all times. As an added measure, many installations will have to configure Windows NT for auto-log-on in order for FirstClass to restart after a power failure.

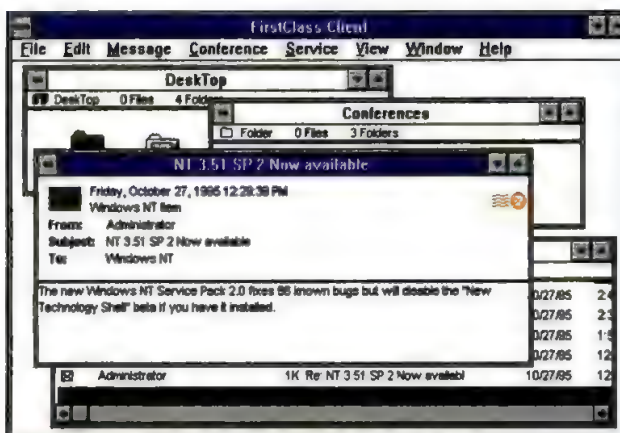
Server administration is handled via the client software by logging in as the "admin" user or as a user with administrative privileges. Detailed usage statistics ranging from open session to modem carrier loss are maintained automatically by the server. The address directory can be maintained on one server and automatically synchronized across multiple servers.

Using the included FirstClass Designer, the administrator can either modify the standard forms or create new

main competitors are Collabra Share, Lotus Notes, and Novell GroupWise. Unlike Lotus Notes, FirstClass can replicate data only between its servers: Thus, clients must be physically connected to the server to create new messages or to read e-mail. Mail is delivered to users on other servers by means of "multihop" routing.

In addition to Macintosh, Power Mac, and Windows versions, a Windows 95 version will be available soon. SoftArc says that a 32-bit client version is planned for release in the first quarter of 1996. And interestingly enough, the client software comes in 12 languages.

Installation of the FirstClass client software was extremely straightforward; setting up a remote connection was simple and worked the first time we tried it. In a smart design move, SoftArc made the interface identical for each platform, eliminating the need to retrain current users



CONFERENCE IN: Electronic conferences are quite simple to conduct using FirstClass Server.

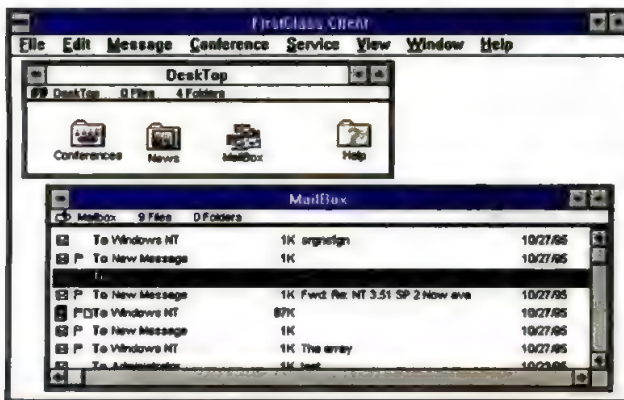
several useful and unique functions, such as the ability to activate auto-reply and auto-forward for all incoming messages. A handy feature that you won't find in Lotus Notes is the Unsend option, which can be used to retract a message you've already sent. For tracking purposes, the Message History function records everything about a message from the moment it was created.

For a full-featured e-mail and groupware package, SoftArc's FirstClass Server 3.0 for Windows NT is a good buy, in terms of both economics and function. The Windows inter-

face is somewhat awkward, and the lack of a Windows 95 client makes it difficult to recommend for PC-only installations. For mixed Macintosh and Windows networks, however, FirstClass is worth investigating.

FirstClass Server 3.0 for Windows NT. List price: \$495 (includes administrator, 5-user license, Windows-client user interface, IPX protocol, and 2-remote-user license). SoftArc, Markham, Ontario, Canada; 800-763-8272, 905-415-7000; fax, 905-415-7151; Web, <http://www.softarc.com>; e-mail, info@softarc.com.

Circle 959 on reader service card



OPEN BOX: From FirstClass Server's client window, you can easily view users' mailbox contents.

forms. A special form called Electronic Forms Stationery can be preaddressed and text can even be entered into the body of a new message. Stationery forms are useful for workflow automation as well.

The administrator can also define a model desktop for each privilege group, defining which icons appear for the users in that group. Modifying the model desktop makes the changes for all users in one easy step.

In the PC market, FirstClass's

and support staff.

Windows users may find that the interface does not follow the usual Windows interface design. There is a button palette for often-used functions, but clicking the right mouse button does not bring up a properties menu, a common feature in many Windows applications. Additionally, on-line help is limited, although detailed help is available in a server-based conference setting.

FirstClass's e-mail system has

CD-ROM SERVERS

Spinning Round Windows NT

By Arun Desai

What, you may ask, has CD Net for Windows NT got that regular Windows NT hasn't got? For starters, you can share more CDs with CD Net than with Microsoft Windows NT. But while that's quite a lot, it's unclear whether this is reason enough to purchase the product.

With the premiere of CD Net, Meridian Data has gotten off to an early start in the Windows NT CD-ROM server arena. Carving a market for this product has been no small challenge, although other companies (such as Logica, with its CDExecutive for Windows NT) are

emerging in this field as well.

Conveying the need for this type of product is difficult, because Windows NT is already quite adept at allowing CDs to be shared across a network. It treats a CD-ROM drive as a standard network drive and makes sharing CDs a snap.

To share a CD-ROM using File Manager, you simply select the drive letter of your CD drive and choose the Share As command from the Disk menu to create a shared resource.

Windows NT also lets you share CDs via a CD tower. If you were to hook up a tower to a native Windows NT worksta-

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be a genius to do it. The new Component Gallery allows you to store and reuse your own C++ components and OLE controls, as well as 3rd-party components. And, MFC 4.0 gives you more than 150 classes and 120,000 lines of code you don't have to write or test.

The new Developer Studio makes reuse intuitive. With ClassView, you can view the relationships between classes. You'll even have one-click access to the MSDN Development Library, Microsoft Visual Test, Fortran PowerStation, and Microsoft Visual SourceSafe™ version control system. And of course, expanded C++ language

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NETWORK EDITION

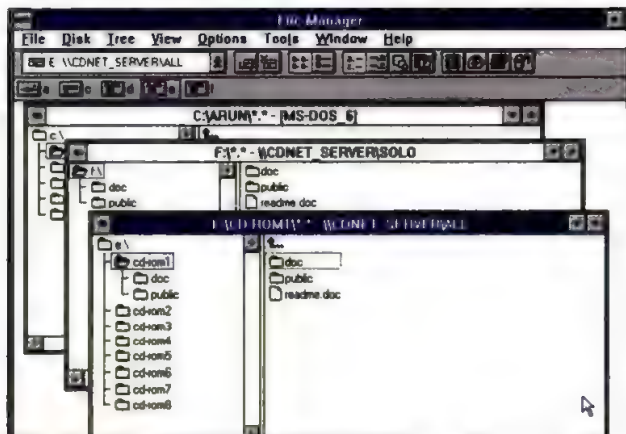
First Looks

tion or server box using a SCSI card, you could easily access the CD devices in the tower. With a few mouse clicks, you could even share these CDs on the network by defining a share point for each CD drive.

Windows NT's management options are somewhat limited, however: Windows NT lets you map only one drive letter per CD-ROM. You can make the

applications still in use.

As for network traffic, CD Net provides a simplistic password protection on CD volume share points. Though the password mechanism isn't secure, it can be used to control CD traffic on a LAN by restricting departmental access to networked CD share points. Passwords can be set on a per-share-point basis but not on a per-user basis.



SERVING CDs: Volume grouping is how CD Net adds true value to Windows NT.

resource available to everyone or set up individual security, and you can also select the maximum number of users who can access the drive.

So with all of this CD-ROM-sharing inherent in Windows NT, why would anyone invest \$1,995 in CD Net for Windows NT? If all you want to do is share a few CDs, then shelling out money for CD Net probably isn't necessary. But if you want to share 15 or more CDs connected to the same CD server, the investment is certainly worthwhile.

Volume grouping is one of the nicest features CD Net provides. This lets CDs connected to the Windows NT box be grouped and presented across the network as subdirectories under a drive-letter root directory, effectively overcoming the drive-letter barrier of Windows NT. CD Net also allows a CD to be presented as a single disk at the root directory of the share point, which satisfies a requirement of some older CD client

This password system works by using an .INI file to store configuration information on the CD share points. The system administrator can manually edit the .INI file to configure various share points, optionally group various drives into particular share points, optionally set up passwords for share points, and optionally control licenses by setting flags such as MaxConnectsPerUser and MaxFilesOpenPerConnect.

CD Net runs as a Windows NT Service, which is handy because it can be administered as any other Windows NT Service from the Control Panel's Services icon. The Service can be started automatically by rebooting Windows NT, or started and stopped manually without rebooting the Windows NT operating system.

Though the ISO-9660 CD format is supported, CD Net for Windows NT doesn't support HFS published disks and Rockridge/Sun proprietary disks. Almost all CDs on the market

meant for Windows clients support the ISO-9660 format.

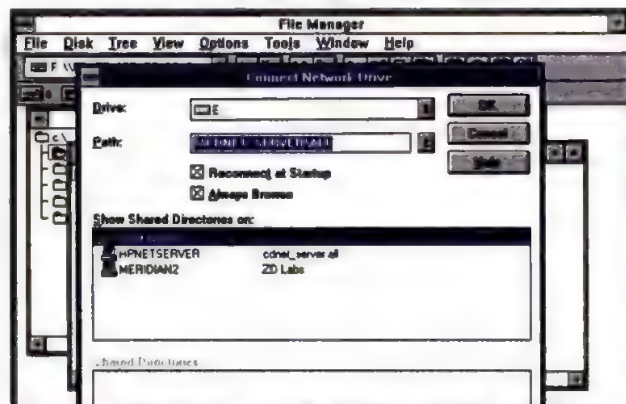
Most CDs meant for Macintosh users use Macintosh's Hierarchical File System (HFS) format, which native Windows NT does support, and are not ISO-9660-compliant. With Windows NT, if you want to share an HFS CD, you can view it as a Windows NT drive and define that drive to be shared on the network. CD Net can coexist with CD drives that are shared using native Windows NT.

We tested CD Net on a LAN with two Windows for Workgroups 3.11 clients and a Windows NT 3.51 server connected to Meridian Data's CD Net-ROM Subsystem CD-tower using a SCSI card. The CD Net software installed quickly and easily. We had to enter the CD server name, license-authorization string, and the installation directory, but fortunately the license-authorization string is printed on the installation disk and is readily available. As for help, we found CD Net's documentation to be neatly orga-

BIOS is an API, and NetBEUI is one of the transport protocols (like TCP/IP and IPX) that NetBIOS can use. Though Windows NT comes with NetBEUI, some system administrators may not appreciate unnecessary NetBEUI packet broadcasts on their LANs.

As for the future, Meridian Data plans to ship Version 2.0 of CD Net in February of this year. Client software that consists of an application launcher as well as the ability to have multiple menus will be added to the upcoming version. This client software will be compatible with Windows 3.1, Windows for Workgroups, Windows 95, and Windows NT. No major changes are planned for the CD Net server software.

The current version of CD Net lacks some key value-added features, such as client-side application launchers for various client platforms and server-side graphical management tools. At best, CD Net provides basic CD-server functionality and volume grouping at a high price.



SERVICE, PLEASE: You can easily access CDs at the client level via CD Net.

nized and easy to follow.

Meridian Data also included some important information about NetBEUI in the release notes. Even when clients are using other protocols (TCP/IP, IPX), the NetBEUI protocol must be loaded for the CD Net server to work. Meridian Data suggests that this is because of NetBIOS's code-library dependencies on NetBEUI. Net-

If you have a need for sharing more than 15 CDs, then CD Net is worth considering. We do recommend, however, that you wait for Version 2.0 if you can. **CD Net for Windows NT. List price: \$1,995. Meridian Data Inc., Scotts Valley, CA; 800-767-2537, 408-438-3100; fax, 408-438-6816; Web, <http://www.meridiandata.com>.**

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First Looks

Microsoft Corp.

Continued from page NE21

But you will need your original Windows NT server disks or CD-ROM to complete the installation.

During the installation routine, FNPW creates a directory called SYSVOL on your Windows NT volume. The SYSVOL directory is equivalent to a SYS volume on NetWare and has the same directory structure, including Public, Login, Mail, and System.

If you want to use the security features built into Windows NT, you must install the SYSVOL directory on a drive formatted with NTFS (NT File System). FNPW also includes copies of all the utilities you need to access your Windows NT server from a NetWare client, such as Attach, Login, Logout, Map, Capture, and Slist.

After you have successfully installed FNPW, you're ready to set up user accounts and other security information. You have two options for setting up users on your Windows NT server: You can use the Windows NT User Manager, or you can use the Migration

Tool for NetWare that comes with FNPW to transfer user names and other Bindery information from your existing NetWare server.

If you have only a few NetWare users who need access to your Windows NT server, the Windows NT User Manager is probably the best utility to use. You can use the User Manager to add new users and restrict their access to certain files, directories, and printers on your Windows NT server. You can also limit the number of times they can connect, and force them to change their passwords after a predetermined time period.

For larger networks, our favorite FNPW utility is the Migration Tool. When you launch the Migration Tool, it automatically determines whether you have FNPW installed. If it finds FNPW, the Migration Tool gives you the option of transferring all of your NetWare user accounts and resources.

All user permissions and security information configured on the NetWare server are transferred to and maintained on your Windows NT server. You can even transfer individ-

Crosstalk

Gail Shaffer: This is a sneaky product, Frank. When Windows NT servers coexist with and are interchangeable with NetWare servers, can Microsoft's total world domination be far behind? Why go to the trouble of adding more NetWare servers at the next LAN expansion? Just throw on another machine running Windows NT Server and you've got it.

Frank J. Derfler, Jr.: But FNPW is slower than a native NetWare server, and people aren't going to dump NetWare overnight. FNPW is useful when you can't install universal client software like Windows 95 or OS/2 Warp, but it's just a useful utility—a small piece in the Microsoft mosaic—not a danger to Novell.

ual login scripts. But you can transfer only Bindery information, and you must store the information on an NTFS volume. For testing, we moved all of the security information from a NetWare 3.12 server and the Bindery information from a NetWare 4.1 file server.

The combination of Windows NT and FNPW is not designed to replace your NetWare servers but is instead intended to make it easier for you to add or phase in a Windows NT server in a NetWare environment. By adding a Windows NT server to your NetWare network, you get the benefits of Windows NT,

namely a powerful platform for client/server application, plus you can keep your NetWare servers and any NLMs you use for network backup, virus scanning, and management.

So if you're planning to switch your entire network to Windows NT, consider FNPW. It's an easy way to make the migration slowly, without the pain of reconfiguring all your client PCs at once.

File and Print Services for NetWare. List price: \$99.95 Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; fax, 206-936-7329; Web, <http://www.microsoft.com>.

Circle 961 on reader service card

COMPUTER TELEPHONES

Ever Taken a Call on Your Computer?

By Frank J. Derfler, Jr.

For many folks, having a good chair, a good monitor, and a good telephone in their offices makes them happy. Though the definition of a good telephone certainly varies, we've got a good, perhaps even great one for those of you who don't live behind a PBX that uses proprietary phones: the AT&T Computer Phone 8130. This phone works with two standard telephone lines, has an RS-232 port, and comes with an integrating software package.

The 8130's Windows-based software has both a card file and an auto-dialer, each of

which can dial the phone; you can also set up the phone instrument through the software.

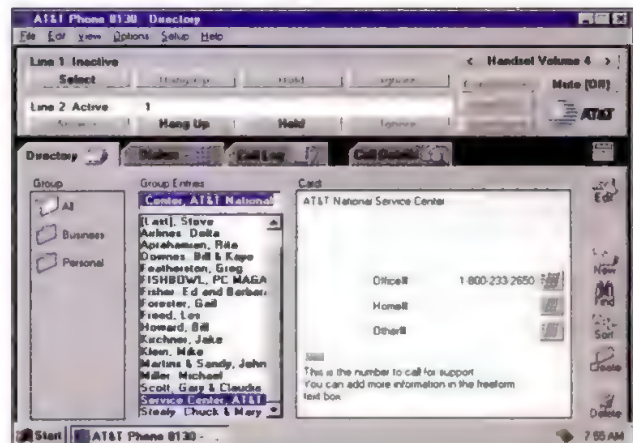
If you bill for your time, you'll be grateful for the call log, which automatically shows the number called and the duration of the call. This system also goes a long way toward setting you up to use more sophisticated call-handling and personal-productivity software.

The 8130 is a good-looking desktop phone in off-white and gray. It includes a speakerphone, nine buttons that can each be programmed to call either of two numbers, and a usable LCD panel, which dis-

plays a clock, the number called, and other information, such as ringer volume.

The phone includes the circuitry to display incoming

Caller ID messages, if you subscribe to that service. In addition, the 8130 reports the last 15 callers, allows you to link names to numbers, and



SEARCH AND CONTROL: The 8130 allows you to control both the phone lines and the database by clicking on the buttons and icons.



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First Looks

reports other statistics.

Some separate Caller ID devices, such as RadioShack's comparatively simple Caller ID 400, sell for as much as \$79.99. This makes the \$199 list price of the full-featured 8130 system look quite reasonable.

The only thing we didn't like about the 8130 is that when the power goes out, the phone does too. In fact, even a slight blip in the AC power sets the clock blinking. The phone remembers its stored numbers during a power outage but, unfortunately, does not remember the time. Plugging the 8130's white, boxy wall transformer into a socket on your UPS is definitely a smart idea.

Though the phone works well by itself, you'll enjoy it more with the companion software. We used a beta version of

the AT&T 8130 software for Microsoft Windows 95, but the program for Windows 3.x has the same functions.

The Windows 95 software should be available by the time this story reaches print. Both the Windows 95 version and the Windows 3.x version will be in the box. AT&T will make the Windows 95 version available to anyone who purchased the phone before that incarnation of the software was released.

The 8130 software allows you to set all of the phone's features, including the programmable calling keys and the clock. You can also adjust the volume of the individual ringers and the speakerphone from the software.

We especially liked the ability to designate one phone line as primary for all outgoing calls,

because that's the way many people work. The 8130's card-file utility includes search features and the ability to sort on selected fields.

With the software installed, the incoming Caller ID screen pops up in an application when the phone rings. If the caller's number or name is in your database, you can look up the record even before you answer the call. You can also make free-form comments in the record during the call.

As a bonus, the AT&T software has an interface for the Telephony API (TAPI), so TAPI applications, such as personal information managers, should be able to use the services of the phone. AT&T says that ACT! with Phone Link and Sidekick 95 from Starfish Software have both been tested with the 8130 system.

AT&T provides the serial cable, so making the telephone/PC connection involves nothing more than plugging in both sides—as long as you have a Windows-capable PC with a free serial port. The interaction between phone and software works best if you run the program all the time, so be sure you have a serial port to spare before trying to install the phone.

Overall, the 8130 is a smooth-working and affordable telephone/PC system with the potential to improve your efficiency. We rate it as a good investment.

AT&T Computer Telephone 8130. List price: \$199. AT&T Consumer Products, Parsippany, NJ; 800-233-2650, 201-581-4607; Web, <http://www.att.com>.

Circle 952 on reader service card

THE NETWORKER By Diane Danielle

Logging In, Nicely



Even for DOS prompt fans, NetWare's LOGIN.EXE leaves much to be desired. It's ugly, it leaves the screen full of computerese, and users have to type too much. Several vendors offer replacements, but it isn't all that difficult to build your own.

The strategy is simple but has some downsides, not the least of which is the fact that you must rename LOGIN.EXE and LOGOUT.EXE. Many experts consider renaming fundamental system utilities to be among the 10 worst crimes you can commit, if only because you must repeat the process every time you upgrade. But if you can live with the consequences, here's how to build your own front end to NetWare.

First, rename LOGIN.EXE and LOGOUT.EXE and put them in the LOGIN directory. Second, create batch files that will call the renamed utilities. You may need two different batch logout files: one in PUBLIC (or another permanently mapped directory) that runs a different one in LOGIN. From the batch files, you can display a menu of available servers (with long, friendly names if that's what you want), pretty pictures, important news. In the login and logout batch files, of course, you must run the renamed LOGIN.EXE and LOGOUT.EXE programs to actually login and logout, respectively.

You must be in the LOGIN directory to run the renamed LOGOUT.EXE. If you're using the NETX shells, you can CD or MAP to the LOGIN directory. If you're using VLMs, you must MAP ROOT the LOGIN directory.

If you have multiple servers and never want users to see a simple NetWare prompt or a "batch file missing" error message, you must implement this strategy on every server. Though the contents of the new batch files in the LOGIN directories of the different servers can differ, they must contain the same

number of bytes (or, again, you'll get a "batch file missing" message). It's important, therefore, to keep files short, simple, and standard. Put information unique to the different servers either in batch or text files that you CALL or TYPE.

You can let your users select the server they want from a simple list and then use an environment variable to pass the server name to the login executable. If you support ANSI.SYS, you can also easily spruce up login failures. First, check to see if the login has succeeded. (I look for a file in the PUBLIC directory since you can't see it unless the login is successful.) If it has, you exit the batch file. Otherwise, use the ANSI commands for moving to a specific cursor location to redisplay the login prompt in the same position and then rerun the login command.

Warning: Don't try this when users are working, and be sure to test several cycles, especially if you have multiple servers. It's easy to screw up—but really nice when it works. E-mail me if you would like some sample code.

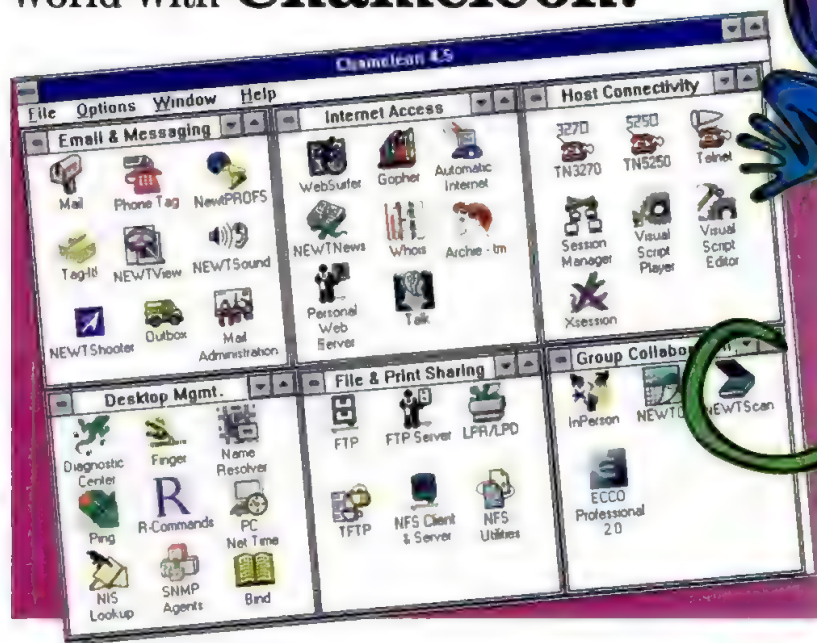
Diane Danielle, an independent networking consultant, can be reached on CompuServe at 72241,2566 or MCI Mail at 383-1159.



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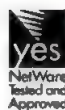
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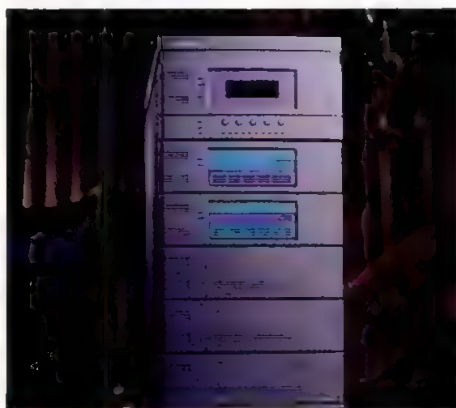
NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Eryn Brown and Robert Daly

Renegade RAID: It's Hot (Swappable, of Course)

For your mission-critical operations, **MountainGate Data Systems** offers its Renegade RAID System. The unit offers up to 42GB of storage on ten 3.5-inch drives. You can opt to have two removable drives as well. The drives are hot-swappable, as are the redundant power supplies and fans. **Renegade RAID System.** Estimated street price: \$30,000. **MountainGate Data Systems Inc., Reno, NV;** 800-556-0222, 702-851-9393; fax, 702-851-5533; e-mail, sales@mntgate.lockheed.com.

Circle 953 on reader service card



THE RENEGADE RAID SYSTEM features an LCD panel for configuration and management.

Motorola's BitSurfr Pro Catches a Wave

Tired of twiddling your thumbs because you can't grab the bandwidth you need? **Motorola Information Systems Group** has released its new BitSurfr Pro ISDN terminal adapter. This Windows 95-compatible product supports voice and data transmissions over ISDN or switched digital lines. Dynamic switching allows use of either or both ISDN B-channels. The BitSurfr Pro is compatible with Windows, DOS, and Apple operating systems.

BitSurfr Pro. List price: \$375. **Motorola Information Systems Group, Huntsville, AL;** 800-365-6456; Web, <http://www.mot.com/MIMS/ISG/>. Circle 954 on reader service card



Catching a Whiff: Sniffer Keeps Up with the Times

It's already one of the biggest names in network management, and it looks as if Sniffer will only get bigger as new technologies proliferate. **Network General Corp.** has announced two new offerings: the ISDN Package for the Sniffer Internetwork Analyzer and the ATM Sniffer Analyzer.

Designed to make ISDN killer apps such as videoconferencing visible to the Sniffer on your network, the ISDN Package decodes BRI and PRI transmissions and can also work with various switch standards. It runs on the Portable High-Speed WAN* Sniffer.

The ATM Sniffer Analyzer is a complete tool that analyzes 155-Mbps ATM networks. It can analyze DS-3, E-3, OC-3c, and STS-3c ATM networks, and it can decode more than 200 protocols—for ATM networks as well as LANs and internetworks. It will have the familiar Sniffer interface. The Distributed Sniffer for ATM should be available later this year.

ISDN Package for the Sniffer Internetwork Analyzer. List price: \$3,995 and up. **ATM Sniffer Analyzer.** List price: \$27,000 and up. **Network General Corp., Menlo Park, CA;** 800-764-3337, 415-473-2000; fax, 415-321-0855; e-mail, support@ngc.com; Web, <http://www.ngc.com>.

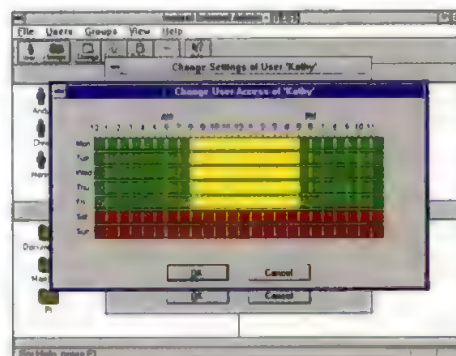
Circle 951 on reader service card

Instant Internet Adds ISDN, 32-Bit Winsock

Options for connecting your business to the Internet continue to proliferate. The latest release of **Performance Technology's** Instant Internet—Version 3.0—adds a built-in 64K ISDN connection, as well as SNMP support, monitoring tools, and access control features. Because it does not require an assigned IP address for each user, Instant Internet can save your memory overhead and management resources.

Instant Internet, Version 3.0. List price: \$4,495. **Performance Technology, San Antonio, TX;** 800-327-8526, 210-979-2000; e-mail, sales@perftech.com; Web, <http://www.perftech.com>.

Circle 955 on reader service card



NO, YOU CAN'T PLAY ON THE INTERNET RIGHT NOW: Instant Internet lets you limit on-line access.

Project Genesis Brings Windows to the BBS

BBSs are now available in designer colors. **Clark Development Co.,** known for the PC Board BBS, has introduced Project Genesis. The package features a GUI interface and works with the Macintosh operating system, OS/2, and Windows 95, NT, and 3.1. It also provides client TCP/IP services. An integrated HTML viewer lets you access the Web without loading any additional communication applications.

Project Genesis. List price: \$499. **Clark Development Co. Inc., Murray, UT;** 800-356-1686; fax, 801-261-8987; e-mail, info@saltair.com.

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Asanté Introduces New, Fast Ethernet Products

The Fast Ethernet market is gaining two new players. **Asanté Technologies** has introduced its first Ethernet/Fast Ethernet switch: the ReadySwitch. Designed to aid users on small to medium-size LANs, it has four 10Base-T ports and one dedicated 100Base-TX port. Asanté has also released the AsantéFast 100 TX/FX Hub, a stackable unit with eight 100Base-TX ports and one 100Base-FX port. The hub provides high-speed transmission over Category 5 UTP or fiber cabling. You can put up to 15 of these hubs in one stack.

ReadySwitch. List price: \$2,195. **AsantéFast 100 TX/FX Hub.** List price: \$1,995. **Asanté Technologies Inc.,** San Jose, CA; 408-435-8388; fax, 408-432-1117; Web, <http://www.asante.com>; e-mail, sales@asante.com.

Circle 957 on reader service card

BRIEFS

HARDWARE

Apex Data is shipping its new Serial Port PC Card (\$149). The card allows users to expand notebook capabilities by connecting additional peripherals to their machines without the bother of juggling connections between external drives, printers, scanners, or trackballs. 800-841-2739.

SOFTWARE

Digital Tools has released AutoPLAN II 3.0, Project Management for Workgroups (\$1,495). This enterprise-wide project manager supports both Windows and Unix environments and incorporates Internet and World-Wide Web links. 800-755-0065.

Bay Networks Joins In On ATM Development

And the snowball rolls on. **Bay Networks** is integrating ATM into its System 5000 product line. The new Bay Networks Model 5000 AH, available through a field upgrade, supports up to 16 ATM ports and has an aggregate switching capacity of 5 gigabits per second. The upgrade includes an integrated ATM control module, LAN management, and network management software. The company is also offering an ATM Routing Engine for its Backbone Node. This solution offers 155-Mbps full-duplex routing between multiple virtual LANs on a single ATM interface. **Bay Networks Model 5000AH.** List price: \$40,875. **Backbone Node ATM Routing Engine.** List price: \$25,500. **Bay Networks Inc.,** Santa Clara, CA; 800-822-9638, 408-988-2400; fax, 408-764-1194; Web, <http://www.baynetwork.com>.

Circle 958 on reader service card

MULTIPLE ACCESS By Steve Buehler

Plug In to Your Network



Want a network in your house?

If you've made a bundle in tech stocks (or even some other smart investments) and you're building a new mansion, design your network right into the walls as they go up. But if you're like the rest of us, you have an older house or you rent. Your options include snaking Ethernet wire under your carpet, squeezing into your crawlspace to fish cable through walls, or springing for wireless or infrared (IR) technology. You can make any of these approaches work, but you know it'll be more hassle than you'd like.

A better way is coming down the tracks, and it will lay the infrastructure to get you *really* connected. Novell has announced an extension to its NEST (Novell Embedded Systems Technology) architecture that lets you transmit information over standard power lines to other NEST-enabled devices.

The underlying concept is not new. A standard called X-10 was developed in 1976 by Pico Electronics to handle 256 devices communicating on power lines. This standard is used today in RadioShack and Honeywell products that let you control lights and appliances from remote stations. That implementation, though, can exhibit problems with reliability, electrical interference, and speed. The concept works (you already

have wiring in the walls, so use it), but the practical aspects are limited to simple applications.

Now, though, Novell has developed a standard that lets NEST-enabled devices communicate over power lines at up to 2 Mbps—more than enough to share data or peripherals (like printers). The first release of products will likely be "network transceiver" boxes that plug into both your serial or parallel port and the power outlet.

These devices, now under development, will let any plugged-in computer send information to any other device plugged into your house wiring. You can send output to remote printers, share data with your kids' computers, or even run household control programs to monitor your electric usage.

The technology could be applied just about everywhere. Instead of using wireless PC Card adapters and access points in your conference rooms, just let everyone

plug into the wall outlets, and you've got an instant LAN. Need to communicate with your sales team on the road? When everyone plugs in, you've got a "hotel area network." This isn't competition for 3Com or Intel's NIC business; it's a complementary technology with specific applications for specific personal area networks.

Novell's on the right track for distributing this architecture. It's joined with Kansas City-based UtiliCorp in the Smart Energy Network Alliance to disseminate the technology; aggressive product goals could mean we see hardware in mid-1996. As major power companies begin to enter the battle to manage your house's energy use and costs, they will add sign-up incentives (like Internet access) to help you get on board this energy train. Your home's brand-new family area network is a freebie in the bargain.



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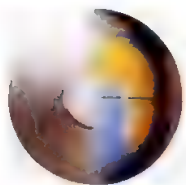


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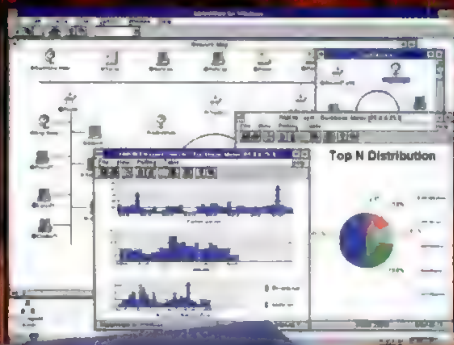
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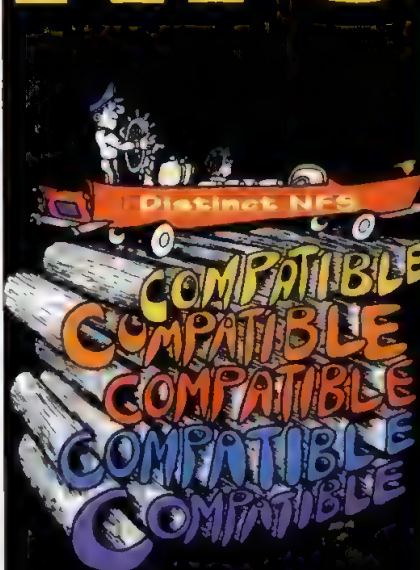


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JANUARY 9, 1996 PC MAGAZINE **NE39**

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PC Magazine, 5/30/95

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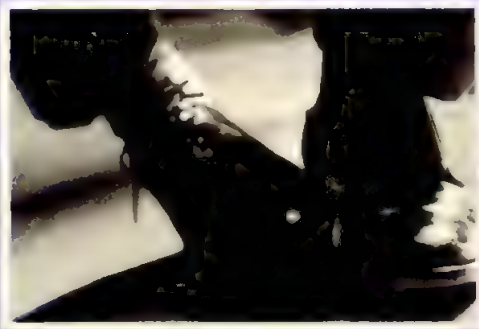
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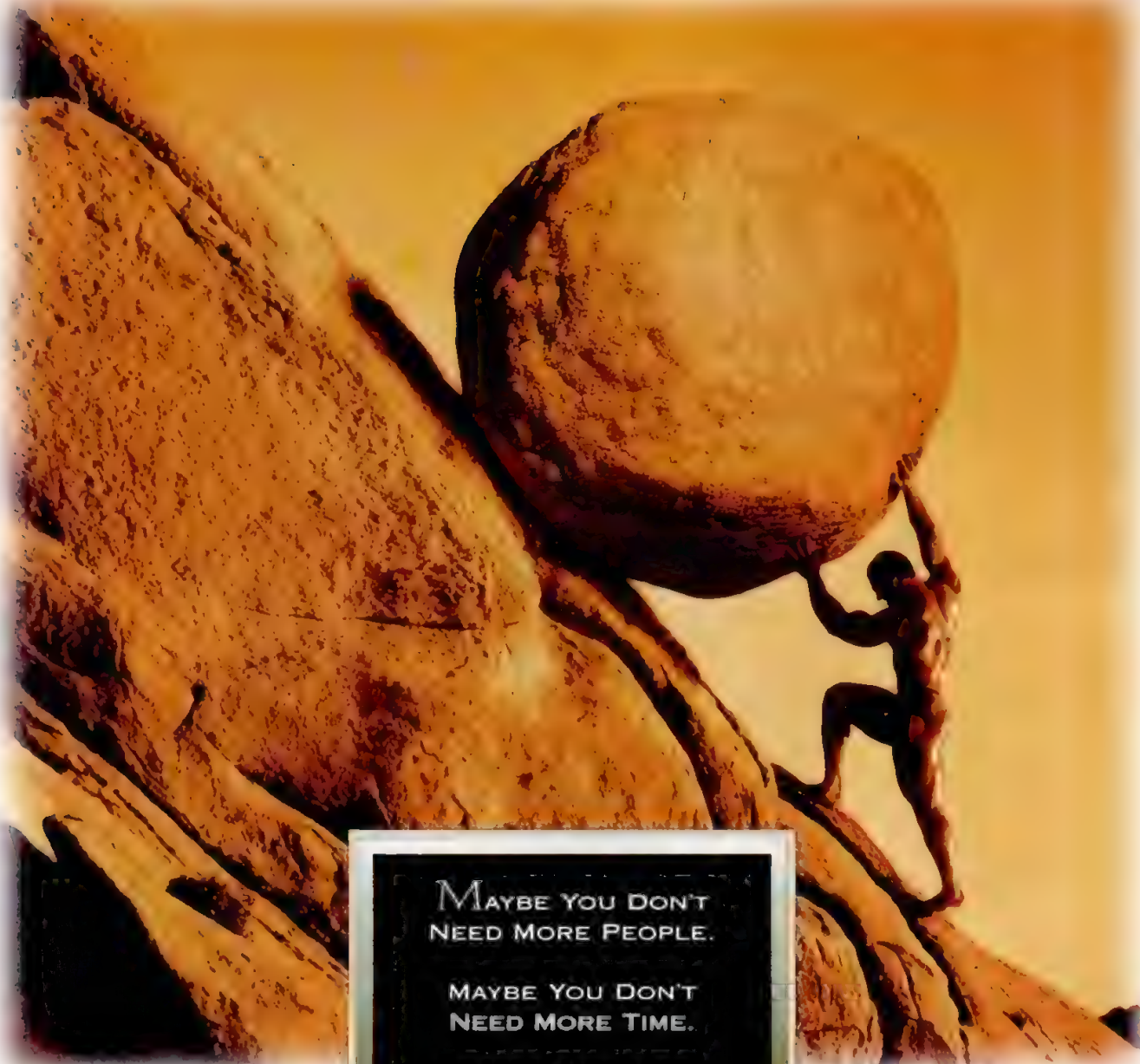


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*Ziff-Davis study, PC Computing, November 1994. Kingston Technology Corporation, 17600 Newhope Street, Fountain Valley, CA 92708 USA. (714) 435-2600, Fax (714) 435-2699.
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PC MAGAZINE CIRCLE 106 ON READER SERVICE CARD

Cover Story

THE BEST OF

1995

Of the thousands of products that passed through our hands, a handful stand out as the best.

Why is it that we can't march into a new year without first pausing to count the blessings of the year just ending? Why are we so reluctant to look forward until we are satisfied that we have met the challenges presented to us in the previous 12 months?

At *PC Magazine* we know exactly why. We remember the surprises, the delights, the time, and the troubles of testing, reviewing, and analyzing the thousands of pieces of hardware and software that numbered our days throughout 1995.

We remember the seemingly endless wait for Windows 95 and the onslaught of products that tumbled from the industry once the new operating system finally took the field. We recall the army of Internet-related products that promised to overwhelm the industry with an entirely new generation of functionality. And we remember the worthy upgrades to the old-guard wares that fulfill our computing requirements day in and day out.

Most of all, we remember the joy of finding that one product in a hundred that rekindled our faith in the innovative spirit and limitless possibilities of personal computing.

For those reasons, once more we follow the *PC Magazine* tradition of entering the new year by saluting the high points of the year gone by. These 45 products, which stand shoulder to shoulder with those that won the coveted Technical Excellence Awards in our last issue, are the very best of a brave group that we happened to share our year with.

By Jake Kirchner



SYSTEMS

- ▶ Micron Electronics' Millennia line
- ▶ Dell Dimension XPS line
- ▶ HP NetServer LH series

In the PC market, 1995 was the year we witnessed the introduction of more new levels of processing power than ever before.

Micron Electronics' **Millennia line** of PCs has become a familiar face in *PC Magazine* roundups in the past year, and with good reason. The company's P120 Millennia was an Editors' Choice winner in our roundup of 100 systems in our May 30, 1995, issue. This year, Micron was one of the first vendors to offer not only sextuple-speed CD-ROM drives but 40-MBps Ultra SCSI hard disks as well. Millennia machines also benefit from the use of Micronics' SyncBurst synchronous L2 cache, which reduces burst-timing wait states for better overall performance.

Micron Electronics Inc., Nampa, ID; 800-388-6334, 208-463-3434. (Reviewed: December 5, 1995, page 178.)

Circle 483 on reader service card

The **Dimension XPS line** (low-end standard, \$1,769; high-end standard, \$3,599) of PCs, from Dell Computer Corp., proved that you don't have to pay a lot to get a lot. The Dimension XPS series is Dell Computer Corp.'s showcase line of cutting-edge componentry and design for power users.

Dell outfits the Dimension XPS line with a full range of Pentium processors, from entry-level 75-MHz models to high-end 133-MHz models. And by the time you read this, Dell will have expanded this line to include systems outfitted with

Intel's new 150-MHz Pentium Pro CPU and Windows NT Workstation.

Dell Computer Corp., Austin, TX; 800-613-3355, 512-338-4400. (Reviewed: September 5, 1995, page 205.)

Circle 484 on reader service card

In 1995, we also witnessed a maturing of the departmental file-server market. One of the best file servers we saw was Hewlett-Packard's **HP NetServer LH series** (5/75 LH Model 1, \$4,679; 5/100 Model 1, \$6,209). The NetServer LH not only offers top performance and superb server-management support, but trend-setting features and design as well. This server, one of the first to use a bridged PCI bus, gives you six PCI slots instead of three. The NetServer LH also incorporates two Fast SCSI-2 controllers, so you can duplex your disk subsystem right out of the box.

HP has since introduced the NetServer LS family, which supports four-way SMP. LS servers also feature HP's PCI Disk Array Controller with dual Fast/Wide SCSI-2 channels, which provide both hot-swap and hot-spare capabilities.—*Carol Venezia*

Hewlett-Packard Co., Santa Clara, CA; 800-322-4772, 415-857-1501; (Reviewed June 27, 1995, page 194.)

Circle 486 on reader service card

PORTABLES

- ▶ IBM ThinkPad 755CD
- ▶ TI TravelMate 5000

The multimedia-equipped notebook took the portable computer industry by storm in 1995, and never did portables—in performance and features—resemble desktops more.

IBM's **ThinkPad 755CD** (\$5,449), which won three Editors' Choice awards in 1995, became the first notebook not only to incorporate a double-speed CD-ROM drive but to include NTSC-compliant video in/out jacks as well. And IBM added dual infrared transceivers and an on-board DSP—with a 14.4-Kilobit-per-second fax modem, 16-bit audio, and telephony functions—to present a fully equipped mobile office in a 7.3-pound package.

In the fall of 1995, IBM once again upped the notebook-features ante with the ThinkPad 760CD. The portable winner of our 1995 Award for Technical Excellence, the ThinkPad 760CD stunningly incorporates a quad-speed CD-ROM drive and a 12.1-inch SVGA display.

IBM PC Co., Armonk, NY; 800-426-3333, 914-766-1900. (Reviewed: August 1995, page 186.)

Circle 487 on reader service card

If you think "desktop-replacement notebook" is an oxymoron, you obviously haven't seen Texas Instruments' **TI TravelMate 5000** (\$3,999). Its list of features reads like the description of a well-outfitted desktop: a 75-MHz Pentium CPU, 256K of L2 cache, and a 772MB hard disk.

As the first portable to incorporate full PCI bus support, the TravelMate enhances both its graphics subsystem and its docking system options. The TravelMate's battery subsystem reached new heights as well: Its two heavy-duty lithium ion batteries lasted an astounding 4 hours on our WinDrain battery tests.—*Carol Venezia*

Texas Instruments Inc., Dallas, TX; 800-848-3927, 512-434-1523. (Reviewed: August 1995, page 206.)

Circle 488 on reader service card

YEARBOOK Experts believe that the number of sites on the World-Wide Web is doubling roughly every



Dell
Dimension
XPS line



IBM ThinkPad 755CD

OPERATING SYSTEMS

► Microsoft Windows 95

In 1995, one operating system developed into more than just a piece of core software. Given the excitement and mega-marketing surrounding its release, Microsoft Windows 95 emerged as a software celebrity.

In many ways, Windows 95 (\$209; upgrade, \$109) is a follower rather than a trailblazer. All the basic features you'd expect in an up-to-date OS, from an object-oriented graphical interface to 32-bit application support, originally appeared in other systems.

Far from a pale remake of others' technology, though, Windows 95 adds substance and gloss to the core features. The result squarely matches the mainstream market's needs.

Both novices and experienced users can benefit immensely from Windows 95's intuitive, powerful, and highly customizable graphical interface. This operating system, which includes unrivaled built-in 32-bit support for all standard PC networks, ships with a huge number of 32-bit device drivers for most standard hardware, network, and peripheral devices. And its hardware detection and Plug and Play capabilities make most setups and network installations a snap.

Unlike other systems, Windows 95 eases you gently into the future. It's compatible with almost all 16-bit Windows applications and real-mode device drivers. For now, Windows 95's sheer usability, fit, and finish outshine the rest.

—Thomas Mace

Microsoft Corp., Redmond, WA; 800-426-

9400, 206-882-8080. (Reviewed: September 26, 1995, page 102.)

Circle 489 on reader service card

WINDOWS 95 SUITES

► Microsoft Office Standard for Windows 95

Despite Microsoft Corp.'s constant assurances that Windows 3.1 users would have no problem switching to Windows 95, not everyone believed that upgrading to the operating system's new suite would prove easy—and worthwhile. Unfortunately, Lotus Development Corp. and Novell had yet to ship their 32-bit, Windows 95-compatible suites and so at press time could offer no competition for **Microsoft Office Standard for Windows 95**.

Microsoft's head start, as the first to hit the market with a new Windows 95-compliant/compatible suite, came as no surprise. But Office Standard made us take notice with its high-quality leaps in application integration and intelligence.

Office Standard (\$499) not only includes upgraded and improved versions of Microsoft Word, Excel, PowerPoint, and Schedule+ 95, but it breaks new ground with a built-in feature called Binder. This OLE container can take disparate files from multiple office applications and

embed them in a single file that you can easily copy or e-mail. Microsoft has also improved its help capabilities by introducing a new Answer Wizard that lets you type in questions instead of key words. The wizard answers with a series of related topics.

Microsoft has enhanced all four components of Office Standard, but more radical changes, such as new file formats, appear in PowerPoint and Schedule+ 95. In particular, PowerPoint's new conferencing feature lets you give presentations over a TCP/IP network. And participants can even annotate the presentation as they follow along.—Lance N. Ulanoff

Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080. (Reviewed: October 10, 1995, page 38.)

Circle 490 on reader service card

FLOW CHARTING

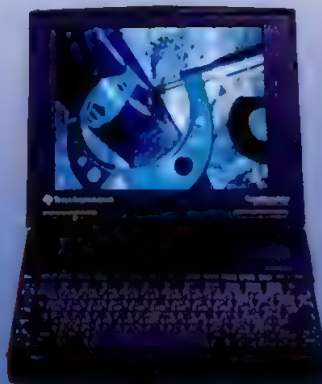
► ABC FlowCharter 4.0

► allClear for Windows, Version III

Whether or not you not feel completely comfortable with graphics tools of any kind, soon you may have to create a *visual* representation of your job, a specific process, or the employee org chart at the office. And then you'll turn to the necessary flow-, process-, and org-charting applications. In

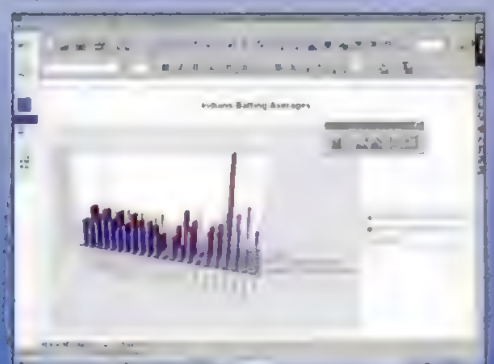
Our Contributors: JAKE KIRCHNER is the editor of *PC Magazine*. DON WILLMOTT is an executive editor, and FRANK J. DERFLER, JR., is the senior networking editor of *PC Magazine*. THOMAS MACE and GAIL SHAFFER are senior editors, LEON ERLANGER is a senior associate editor, and JAMIE M. BSALES, MICHAEL RYAN, and CAROL VENEZIA are associate editors of *PC Magazine*. ERYN R. BROWN, YVONNE KOULOUTHROS, and CADE METZ are staff editors, and JIM SEYMOUR is a contributing editor. BEN Z. GOTTESMAN is the technical director of software at PC Magazine Labs, and LANCE N. ULANOFF was the senior associate editor in charge of this story.

three-to-five months.



Ti TravelMate 5000

Microsoft Office Standard for Windows 95



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	575e	5120e	5100	5133
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Std./Max. Memory	8MB/136MB	8MB/136MB	16MB/192MB	16MB/192MB
Hard Drive	630MB or 1GB	630MB or 1GB	630MB or 1GB	1GB
Cache Internal	16KB	16KB	16KB	16KB
Cache External	256KB (optional)	256KB (optional)	256KB	256KB
Architecture	PCI	PCI	TriFlex/PCI	TriFlex/PCI
Video Memory/Max.	1MB/2MB	1MB/2MB	1MB/2MB	1MB/2MB
Compaq 150 Color Monitor	Yes	Yes	Yes	Yes
Diskette Drive	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB
Expansion Slots (Total)	3	3	4	5
Drive Bays (Total)	3	3	4	5
Ports: Serial/Parallel	1/1 (ECP)	1/1 (ECP)	1/1 (ECP)	1/1 (ECP)
Security Features	Yes	Yes	Yes	Yes
Processor Upgradable	Yes	Yes	Yes	Yes
101-Key Keyboard, Mouse	Yes	Yes	Yes	Yes
Software Preinstalled (Choice of)	MS-Windows® 95 or MS-Windows 3.1	MS-Windows 95 or MS-Windows 3.1	MS-Windows 95 or MS-Windows 3.1	MS-Windows 95 or MS-Windows 3.1
Energy Star Compliant	Yes	Yes	Yes	Yes
Limited Warranty*	3-Year	3-Year	3-Year	3-Year
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1995, no two products understood these tasks better than Micrografx's ABC FlowCharter and Clear Software's allClear for Windows, Version III.

ABC FlowCharter 4.0 impressed us with its intuitive interface and depth of functionality. The collision-avoidance algorithm particularly helps you when you must build complex charts, and it also handily moves entire segments of an org chart when you shift one related segment. Version 4.0 includes OLE compatibility and the since-released 6.0 integrates with Micrografx's new ABC Graphics Suite. Without a doubt, ABC FlowCharter remains one of the most highly automated products of its kind.

Micrografx Inc., Richardson, TX; 800-733-3729, 214-234-1769. (Reviewed: May 30, 1995, page 211.)

Circle 491 on reader service card

Sometimes a peculiar presentation pays off. Clear Software's **allClear for Windows, Version III** (\$299), looked like some sort of strange specimen when we evaluated flowcharting packages. It didn't feature drag-and-drop and seemed to take matters out of your hands. Upon closer investigation, though, we came to see the beauty of allClear's process. Essentially, you start with the product's plain-English scripting language by typing in process names and relationships. allClear offers many sample scripts and templates, so you just hand your script off to the application and voila! A formidable flow or org chart appears.—*Lance N. Ulanoff*

Clear Software Inc., Newton, MA; 800-338-1759, 617-965-6755. (Reviewed: May 30, 1995, page 214.)

Circle 492 on reader service card

WINDOWS 95 UTILITIES

- ▶ Norton Navigator for Windows 95
- ▶ Microsoft Plus!/DriveSpace 3

The emergence of Windows 95 brought a breath of fresh air to several types of utilities in 1995. Two utilities quickly and impressively took advantage of the new operating system and made something very good even better—and easier to use.

Symantec Corp. wowed us again with its latest desktop manager, **Norton Navigator for Windows 95**. If Explorer, the file manager in Windows 95, doesn't fulfill all your needs, get the proficient Norton Navigator.

For a street price of \$99, Norton Navigator does more than just serve as a desktop enhancer and file manager. Not only does the Norton File Manager exceed Explorer's amount of file and directory-management services, but it also includes better Documents and Run commands, direct access to individual Control Panel applets, FTP awareness, a highly efficient navigation through nested folders, and a multiple-level Undo command.

Symantec Corp., Cupertino, CA; 800-441-7234, 503-334-6054. (Reviewed: November 21, 1995, page 166.)

Circle 494 on reader service card

The other utility that caught our attention, the disk compressor **Microsoft Plus!/DriveSpace 3**, comes from Microsoft Corp. DriveSpace 3's 32-bit architecture, high compression rates (up to a total of 2 GB at a time), recognition of long filenames, and three levels of compression make it ideal for use under Windows 95.

DriveSpace 2 comes free as part of Windows 95, but it's just not as customiz-

able or powerful as its big brother. What's more, DriveSpace 3 is bundled in the \$49 Microsoft Plus—a steal of a deal that includes desktop themes, system managers, and other tools.—*Yvonne Koulouthros*
Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080. (Reviewed: November 21, 1995, page 171.)

Circle 493 on reader service card

GROUPWARE

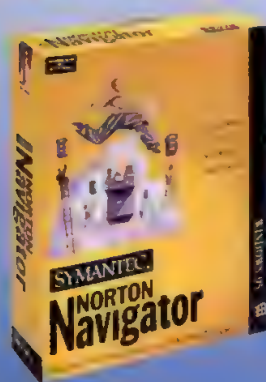
- ▶ Collabra Share 2.0

In 1995, Microsoft Exchange didn't ship. Neither did Lotus Notes 4.0. (At least not by the time we went to press.) Thus, the two most anticipated events in the groupware market became non-events. But don't think that this market sat idle. Two giant takeovers took place: IBM wagered \$3.5 billion on Lotus, and Netscape spent \$108 million on Collabra Software.

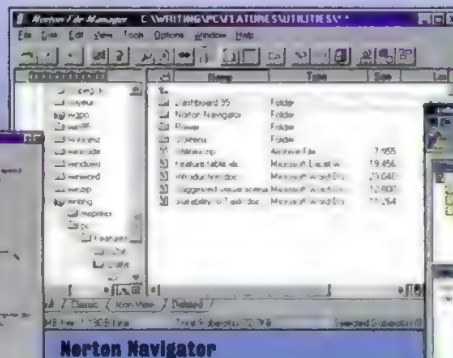
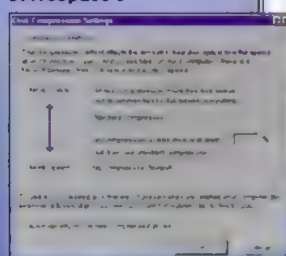
Since Collabra originally introduced **Collabra Share** (Workgroup Edition, \$69.95 per user; Client/Server Edition, \$99.95 per user; Collabra Share Server for Windows NT, \$995), it has been the premier program for enabling discussions within a workgroup. Collabra recognized that not everyone necessarily works in the same building, so it enabled e-mail users to collaborate and participate in the discussions.

Collabra's latest version, 2.1, adds many useful features including thread summaries, to help wrap up a discussion, and QuickLinks, to hop between documents. Perhaps most important, though, Collabra advanced to a client/server architecture with a Windows NT-based

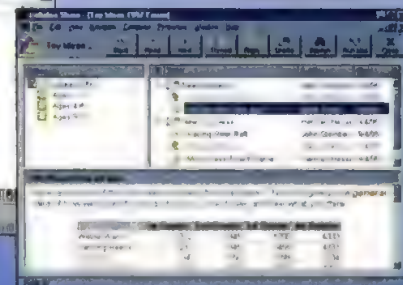
YEARBOOK 400,000 people beta-tested Windows 95.



Microsoft Plus!/DriveSpace 3

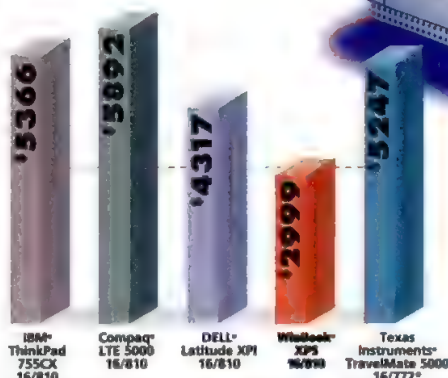


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Jim Seymour's Thumbs Up, Thumbs Down

What a year. A cracker salesman turns IBM around, then hires a chicken salesman as his strategy guru. Apple has hit machines and sees its authorized-clones program get off to a fast start—then can't find enough parts to build its own machines, suffers sales lags, and puts clone authorizations on hold to save for itself the world supply of critical parts.

And of course, the biggest story: Microsoft finally ships Windows 95, to a fast start on the consumer side but a cool reaction among businesses. Help-line phone traffic is immense; stores sell Windows 95 in midnight-madness pizza parties. And of course, IBM once again can't figure out how to respond and blows another great opportunity.

Surprised? Naw, remember: This is the PC business, full of strangers in a very strange land. Among the year's better moments:



Corel announced Corel-DRAW 6 in June, with a whopping \$429 upgrade price for long-time (and some say, long-suffering) Corel users. Bad decision, Captain Mike. Two weeks later, after a firestorm of complaints, Corel backed down and reduced the upgrade price to a still stiff but more palatable \$249. Good decision, Captain Mike.



Presenting Contestant Number One in the "Worst New Words Spawned by the Computer Industry" (WNWSCI, and no accident that it's pronounced "Win-whiskey") pageant: *digerati*.



IBM angered buyers of its ThinkPad 700 series machines by declaring that it wouldn't support Windows 95 on the ThinkPad 700—though many 700s were so new that they were still under warranty.



Millions of Windows 3.x users would like to upgrade their copies of Microsoft Word, Excel,

PowerPoint and Access. But the new versions of those apps are Windows 95-only. Bill Gates said it plainly enough at the Windows 95 rollout: "Let me be clear: Office 95 is the upgrade for Microsoft Office; Word 95 is the upgrade for Word. Excel 95 is the upgrade for Excel." Perfectly clear, Bill: "Tough luck, customers."



In a year of amazing acquisitions, Netscape may have made the smartest: Collabra Software, developers of the Lotus Notes-competitor, Collabra Share. And it's a natural intra-Net partner for Netscape Navigator.



Onstage next, WNWSCI Contestant Number Two: *enterprise*.



Nebraska's Senator James Exon made a fool of himself by sponsoring the unworkable Communications Decency Act, a full frontal attack on the First Amendment that would criminalize "indecent" conduct on-line.



Cracker salesman he may be, but IBM's Lou Gerstner rewrote the rules for takeovers in June, with a stunning, week-long assault on Lotus. By making a high-dollar offer, sweet-talking Lotus employees from the minute the offer was posted, and never letting up the pressure, Lou brought Lotus Chairman Jim Manzi to the table in record time. And three months later, Jim was gone. Three questions, Lou: Was Lotus really worth \$3.5 billion? Can you make money on the deal? And did you expect Jim to take that long?



Alluring in a lovely Jantzen two-piece, here's Contestant Number Three in WNWSCI: *cybrarian*.



AT&T, having bought NCR for \$7.5 billion in 1990 and having lost several billion dollars more as it

tried to pump up its new computer business, gave up in September—taking another \$1.2 billion write-off for the costs of closing the doors. AT&T Global Information Systems PCs will disappear, and the spin-off GIS operation will focus on selling minis, plus a few desktop PCs licensed from Intel. AT&T's board members loyally supported CEO Bob Allen throughout: as he bought it, as he blew it, and now as he's folding it. Hmm: Does ol' Bob have some pictures of those board members doing naughty things?



Sun bundled almost all of the best ideas about how Web servers and browsers ought to work together into Hot Java, a sizzling technology that slowly crept toward market in the last half of 1995. It's so good, Sun's competitors are rebuilding their products to include the best of Java.



Is Apple boss Mike Spindler trying to retire the Thumbs Down Lifetime Achievement trophy? This year, Apple couldn't deliver enough of its splendid PowerPC machines and so gave away sales. It couldn't agree with IBM on an acquisition. It couldn't persuade IBM to adopt the Mac operating system for IBM's own PowerPC boxes. It brought out nice new PowerBooks only to recall the top-of-the-line machines weeks later because two of them caught fire while in use by Apple's own employees. And its CFO, Joe Graziano, asked the board to sell the company because it was no longer viable—and quit when they said no. Meanwhile Spindler threw more cash down the Newton hole and pounded the table, claiming the press wasn't giving Apple a chance. Right, Mike.



Nebraska's Senator James Exon decided to retire.

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server option for those who need a larger or more scalable environment.

Collabra Share will probably only get better: Netscape's acquisition of the product makes the Internet a viable alternative to Lotus Notes.—*Ben Z. Gottesman*

Netscape Communications Corp., Mountain View, CA; 415-528-2555, 800-638-7483. (Version 2.0 reviewed: November 21, 1995, page 210.)

Circle 495 on reader service card

CONTACT MANAGEMENT

► GoldMine 2.5a for Windows

In 1995, a plethora of former PIM-like software products promised not only to manage your personal business life but your workgroup one as well.

The most successful is ELAN Software Corp.'s **GoldMine 2.5a for Windows**, whose latest release shows the product's smooth transition from DOS to Windows. Always targeted at the workgroup, GoldMine (\$295) wisely understands the needs of contact management software users: to exchange contact information, schedule plans, and e-mail each other. In addition, the new version interfaces with Microsoft's Schedule+ and Microsoft Mail to allow free exchange of information among GoldMine users.

The tabbed interface lets you store virtually unlimited general and sales-related contact information. In addition, a new feature called Automated Processes lets the software perform one or many repetitive tasks, such as sending follow-up letters and scheduling calls.

To aid support for disbursed workgroups, ELAN released GoldSync, a

companion product that eases synchronization of contact information, scheduling data, and notes between remote users and the network. And GoldSync servers can even talk to one another in a WAN environment. Clearly, GoldMine has not left many contact management stones unturned.—*Ben Z. Gottesman*

ELAN Software Corp., Pacific Palisades, CA; 800-654-3526, 310-454-6800. (Reviewed: August 1995, page 260.)

Circle 496 on reader service card

MONITORS

► Nanao FlexScan T2-17TS

Seventeen-inch monitors have become great bargains, selling for as low as \$599 while adding useful features like on-screen controls, power management, and color-matching software.

If you're a graphic artist looking for the sharpest, most accurate image you can get, then we suggest the **FlexScan T2-17TS** from Nanao USA Corp. Though the monitor has a street price of \$1,149, it was the sharpest 17-inch monitor we saw, with bright, saturated colors and no visible image distortion. And Labs-based testing backed up what we saw with our eyes.

The monitor's extensive, on-screen controls even allow you to make many adjustments with your mouse. Plus Sonnetech's Colorific color-management software and Windows 95 Plug and Play support are just icing on the cake.—*Leon Erlanger*

Nanao USA Corp., Torrance, CA; 800-800-5202, 310-325-5202. (Reviewed: September 12, 1995, page 182.)

Circle 497 on reader service card

INTERNET AND ON-LINE

- Netscape Navigator
- America Online
- CompuServe/Internet Division Internet Office

In 1995, the Internet continued to grow at a stunning, exponential rate. Particularly, the World-Wide Web has grown like kudzu from the obscurity of Unix workstations into the conspicuous world of popular culture.

The chief reason for this cyberspace explosion was **Netscape Navigator**, an amazingly versatile browser that has managed to garner nearly 80 percent of the market. You can download the Navigator without charge from Netscape's Web site (<http://home.netscape.com>) or its FTP site (<ftp://netscape.com>), or you can purchase it off the shelf for \$44.95.

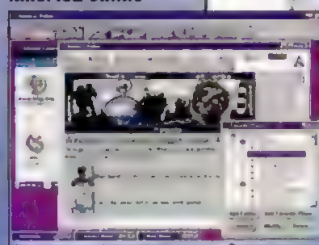
Not only can Navigator access HTML Web servers, but it also supports Gopher, FTP, SMTP, and NNTP from the same convenient window. You can even open multiple instances of this window and peruse several different sites concurrently. With support for the latest in Web graphics (HTML 3.0) and TCP/IP interface (Winsock 2.0), Netscape has set an industry standard.

Although competitors are struggling to keep up with this perpetually evolving precedent, many users have already graduated to the beta version of Netscape Navigator 2.0. The latest release supports embedded applets written in the Java programming language and a framing feature that can divide your browser's window among multiple sites. Stay tuned for Netscape's next developments.

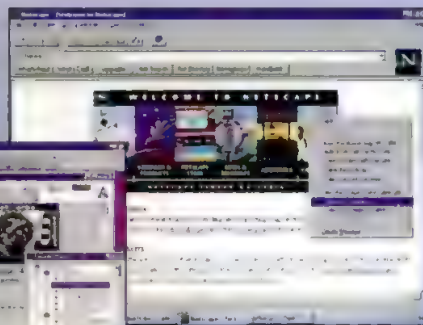
YEARBOOK In 1995, 36 percent of new PCs went into the home.



America Online



Netscape Navigator



Nanao FlexScan T2-17TS

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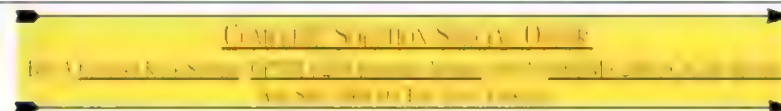
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Modem	Average throughput (33.6k-bps connection)
US Robotics Courier V Everything (33.6k-bps connection)	63.4
AT&T Cosphere 3825plus (33.6k-bps connection)	63.7
Hayes OPTIMA 288 w/LSI* (28.8k-bps connection)	79.4

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CIRCLE 136 ON READER SERVICE CARD

Netscape Communications Corp., Mountain View, CA; 800-638-7483; 415-528-2555. (Reviewed: October 10, 1995, page 188.)
Circle 498 on reader service card

More than 3.5 million people use **America Online**. Its rapid nationwide speed of 28.8 Kbps and Web support—in addition to its FTP, Gopher, telnet, and Usenet software—has made it the Internet provider of choice. Its latest software, America Online for Windows 2.5, not only offers the slickest in change-on-the-fly art, but also provides the most impressive Web browser in the on-line service genre. This integrated, easily accessible browser supports HTML 2.0, contains a helpful hotlist of sites, and is fully compatible with the latest Winsock standard.

Of course, you can also use a third-party browser or other TCP/IP applications via AOL's own stack or a third-party stack, such as the one that ships with Windows 95. One of AOL's finest features, however, is its pricing: just \$9.95 per month for five hours of use and \$2.95 for each additional hour.

America Online Inc., Vienna, VA; 800-827-6364, 703-448-8700. (Reviewed: October 10, 1995, page 11.)

Circle 499 on reader service card

If you desire a complete and unabridged suite of Internet tools, **CompuServe/Internet Division Internet Office** (Navigator Edition, \$199; Professional Edition, \$399) leads the pack. It provides versatile TCP/IP connectivity (SLIP, PPP, or direct LAN) as well as impeccable Web, Gopher, Mail, News, FTP, and telnet software. And its SPRY Mosaic Web browser includes a full-featured bookmark list and support for HTML 2.0.

SPRY News, which lets you categorize

newsgroups via drag-and-drop, and SPRY Mail, which allows you to sort messages effortlessly and attach files via the MIME standard, add to the robust flavor of Internet Office. And the SPRY Network File Manager even integrates with its Windows 3.x namesake to provide concurrent access to multiple, remote FTP sites. So although you may be able to assemble a better suite of tools from unrelated vendors, you will not find a better single-box solution than Internet Office.—Cade Metz

CompuServe Inc., Bellevue, WA; 800-777-9638, 206-447-0300. (Reviewed: October 10, 1995, page 186.)

Circle 500 on reader service card

NETWORKING AND COMMUNICATIONS HARDWARE

- ▶ Intel EtherExpress PRO/100B Adapter
- ▶ Microtest DiscPort series
- ▶ U.S. Robotics Courier V. Everything with v.34
- ▶ Shiva LanRover/E PLUS, Revision 3.5

At least four trends simultaneously excited the networking hardware world in 1995: Fast Ethernet, delivery of programs on CD-ROM, fast analog modems, and remote access. We're moving up to 100-Mbps signaling on the LAN cables so we can stream files and programs off of CD-ROM servers. We're moving through 28.8 Kbps and on to 33.6 Kbps for dial-up access to the Internet. And we want to do all of this from home while accessing the corporate LAN.

Even if you aren't yet using 100-Mbps

Fast Ethernet, it still makes sense to buy dual-speed 10/100 adapters for your new PCI bus computers. **Intel EtherExpress PRO/100B Adapters** (single adapter, \$169; 20-pack, \$149 per adapter) are among Intel Corp.'s Fast Ethernet adapters that have been at the top of the 10/100 market throughout 1995. They're very affordable, excellent performers.

Intel Corp., Hillsboro, OR; 800-538-3373, 503-629-7354. (Reviewed: September 26, 1995, page NE26.)

Circle 501 on reader service card

Microtest moved a couple of mountains in 1995 to make CD-ROMs easy to share. The company has a family of products, notably the **DiscPort PRO** and the **DiscPort Tower**, that make networking CD-ROMs look like child's play. The Pro (\$1,595) connects to any external CD drive and then to your LAN. It has two SCSI ports, so you can daisy-chain up to 14 drives. The Tower (\$3,195) looks like a tower PC but contains four drives. Both come with DiscView PRO, Microtest's excellent File Manager-like CD management package.

Microtest Inc., Phoenix, AZ; 800-526-9675, 602-952-6400. (Reviewed: August 1995, page NE26.)

Circle 501 on reader service card.

Despite 1995's profusion of modem standards, a solid, complete modem still exists: **Courier V. Everything with v.34** from U.S. Robotics (external model, \$525). With it, you can dial any service or server and know that you'll get the best connection that your phone lines will allow. The Courier V. Everything has loads of features, including 33.6-Kbps capability, flash ROM, asymmetric channels, and password-protected call-back.

YEARBOOK Netscape stock jumped 267 percent on its first day of trading.

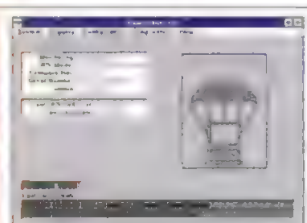


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COVER STORY
The Best of 1995

U.S. Robotics, Skokie, IL; 800-877-2677, 708-676-7010. (Reviewed: March 14, 1995, page 270.)

Circle 503 on reader service card

Remote access saw some tough competition in 1995, but nonetheless, Shiva's tight focus on its products kept it in front. The designers of the **LanRover/E PLUS, Revision 3.5** (\$4,999) attacked ease of use head on: Literally, you plug it in and it plays. LanRover/E Plus, Revision 3.5, a stand-alone turnkey access server, has great performance and reliability. In addition, Shiva worked with Microsoft to develop the remote-access client in Windows 95, so the LANRover/E is tightly integrated with the newest operating system. —Frank J. Derfler, Jr.

Shiva Corp., Burlington, MA; 800-977-4482, 508-788-3061. (Reviewed: June 13, 1995, page NE23.)

Circle 504 on reader service card

NETWORKING AND COMMUNICATIONS SOFTWARE

- Palindrome Storage Manager 4.0
- Avanti NConsole v2.0 for Windows
- Intel LANDesk Management Suite 2.01
- Microsoft Windows NT Server 3.51

In the world of networked computing, hard-working, reliable software manages the flashy hardware. And though some often go unheralded, we remember four network software products that left their marks as the best of 1995.

Palindrome Corp. introduced a full-featured and easy-to-use Hierarchical Storage Management (HSM) package,

Palindrome Storage Manager 4.0 (\$995). This affordable product includes full network backup capabilities.

Palindrome seamlessly integrates HSM functionality with standard backup and archiving functions, which eliminates the integration problems that many companies faced in the past. Now Storage Manager does it all for them.

Palindrome Corp. (a Seagate Software Company), Naperville, IL; 800-288-4912, 708-505-3300. (Reviewed: September 26, 1995, page NE22.)

Circle 505 on reader service card

Avanti NConsole v2.0 for Windows (\$295 without SMP; \$395 with SMP) is a slick Windows-based utility that monitors various NetWare server statistics. NConsole conveniently allows you to cram many different presentations of the statistics on-screen, handily keeps tabs on trends, and swiftly spots potential problems on the server.

Avanti Technology Inc., Austin, TX; 800-638-1168, 512-335-1168. (Reviewed: July 1995, page NE36.)

Circle 506 on reader service card

If you're in a NetWare environment, you won't want to miss Intel's **LANDesk Management Suite (LDMS) 2.01**. A bundle of 13 applications presented in a single package for the NetWare manager, LDMS 2.01 has the look and feel of Windows' File Manager, so the various metering, monitoring, and management tools are easy to use. This comprehensive suite also includes asset management, alerts, and queues.

Intel Corp., Hillsboro, OR; 800-538-3373, 503-264-7354. (Version 2.0 reviewed: April 11, 1995, page NE23.)

Circle 507 on reader service card

The high-performance file and print server **Microsoft Windows NT Server 3.51** (\$699) includes File Manager and other tools. It can run all of your applications and most utilities, and it can also haul a huge load of networking services on multiple processors. As the current NOS of choice for client/server applications, Windows NT Server 3.51 deserves praise for its ease of use, affordability, reliability, and power. —Frank J. Derfler, Jr.

Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080. (Reviewed: October 24, 1995, page 210.)

Circle 508 on reader service card

PRINTERS

MULTIFUNCTION:

- Xerox Document WorkCenter 250

COLOR INK JET:

- HP DeskJet 855C

PERSONAL LASER:

- HP LaserJet 5L

WORKGROUP LASER:

- Lexmark Optra R+

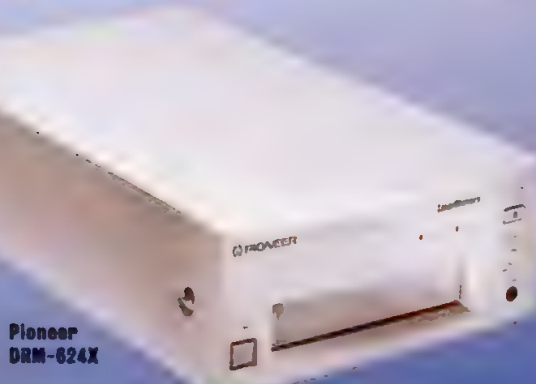
DEPARTMENTAL LASER:

- HP LaserJet 5Si MX

Remember when only dream printers had 300 dpi? Now we can even get 600-dpi laser output from color ink jets and laser printers—and at good prices.

When you think of home-office equipment from Xerox, you think of its reliability and its many features—as well as its costliness. But don't despair: Take a look at the Xerox **Document WorkCenter 250**, a multifunction printer that delivers 300-dpi ink jet printing, full-featured faxing, light-duty copying, and scanning with Xerox's acclaimed TextBridge OCR software—

YEARBOOK The number of ThinkPad 760CD laptop computers IBM would have to sell to pay for its



Pioneer
DRM-624X



HP DeskJet 855C



Xerox Document
WorkCenter 250

all at a very competitive \$699. (You can also get a \$100 rebate through January 31, 1996.) If you're a home-office buyer who can't afford to spend thousands of dollars on a multifunction printer, the WorkCenter 250's space- and cost-saving appeal—along with Xerox's dependable service—will definitely win you over.

Xerox Corp., Rochester, NY; 800-832-6979, 716-427-5400. (Reviewed: October 24, 1995, page 54.)

Circle 509 on reader service card

Color ink-jet printers continue to improve, and the **HP DeskJet 855C** currently reigns supreme. This \$663 unit from Hewlett-Packard has a 7-ppm monochrome rating and a new high-density black ink, so monochrome text and graphics lose that grayish tinge characteristic of past ink jet output. It also has a 300- by 300-dpi resolution-enhancement mode that creates smaller dots for excellent color output. If you particularly want to replace your aging personal laser with a color ink jet printer, look no further than the affordable DeskJet 855C.

Hewlett-Packard Co., Santa Clara, CA; 800-752-0900, 415-857-1501. (Reviewed: November 7, 1995, page 238.)

Circle 510 on reader service card

If you need the clean, crisp monochrome output that only a laser printer can deliver, you'll want the **HP LaserJet 5L** (\$599). Other personal laser printers now boast 2 ppm more than LaserJet's rate of 4 ppm, but none can match the LaserJet's stunning 600-dpi output. In addition, its software control panel gives easy, intuitive access to all the printer's functions. So if you're willing to sacrifice some speed for visibly better output quality (and we think you should), opt for the LaserJet 5L.

Hewlett-Packard Co., Santa Clara, CA; 800-752-0900, 415-857-1501. (Reviewed: November 7, 1995, page 210.)

Circle 511 on reader service card

Faster print speed and 1,200- by 1,200-dpi output set the Lexmark **Optra R+** (\$1,400) apart from the field of work-group laser printers. Lexmark recently upped the engine speed from 12 ppm to 16 ppm (without raising the price). The Optra R+ also now provides two I/O slots that can accommodate two network interface cards, and a four-line LCD readout on the control panel provides plenty of status information. And you can't beat Optra R+'s outstanding MarkVision software utility that lets network administrators easily and efficiently manage all the printer's functions from any PC.

Lexmark International Inc., Greenwich, CT; 800-891-0331, 606-232-2000. (Reviewed: November 7, 1995, page 212.)

Circle 512 on reader service card

The evolution of the network printer continues, and HP leads the way with its \$4,899 **HP LaserJet 5Si MX**. This departmental laser printer increases its speed to an unsurpassed 24 ppm and doesn't sacrifice print quality in the process. With this printer, HP also delivers an improved version of its classy administration software, JetAdmin. The HP Windows Driver and JetAdmin now allow end users to customize print jobs with watermarks, create booklets and thumbnails, and check on a print job's status without leaving their PC. —*Jamie M. Bsaies*

Hewlett-Packard Co., Santa Clara, CA; 800-752-0900, 415-857-1501. (Reviewed: November 7, 1995, page 204.)

Circle 513 on reader service card

CD-ROM DRIVES

► Pioneer DRM-604X

Give them 650MB, and they'll take a gigabyte. "They" are multimedia software developers, who can't seem to fit today's data- and video-intensive applications onto one silver platter anymore. Map utilities, database lists, and even games are spilling onto several CD-ROMs, which means annoying the disk-swapping for owners of single-disk players. Of the multi-disk changers currently on the market (and there are more on the way), we think that one of the first reigns as the best. The **Pioneer DRM-604X** player, available for about \$475, uses straightforward plug-and-play set-up and a cartridge caddy to hold up to six disks at a time.

This newest iteration, the DRM-624X, ups the player's speed to 4.4 Kbps, which should give a noticeable performance boost to video playback on standard quad-speed drives. All in all, this external mini-jukebox proves to be a handy hassle-reliever. —*Jamie M. Bsaies*
Pioneer New Media Technologies Inc., Long Beach, CA; 800-444-6784, 310-952-2111. (Reviewed: March 28, 1995, page 156.)

Circle 514 on reader service card

SOUND CARD

► Turtle Beach Tropez

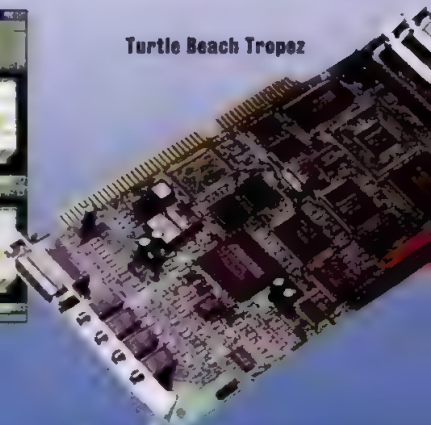
Sound cards have improved tremendously since we first started reviewing them three years ago: These days, no longer do you have to pay more than \$300 for top-quality

acquisition of Lotus: roughly 1,166,667.



Avant! NConsole v2.0 for Windows

Turtle Beach Tropez



THINKING



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sound and Sound Blaster compatibility.

Turtle Beach Systems, the leader in this arena, continues its dominance with its star sound card. The \$249 **Turtle Beach Tropez** features the same excellent ICS WaveFront wavetable synthesizer found in its sibling, Turtle Beach MultiSound Monterey, which slightly exceeds Tropez in sound quality. Tropez comes with a separate microphone and a number of useful Windows applets for MIDI composition and digital recording. It also includes 2MB of sample RAM and room for up to 12MB of additional RAM. And of course, Sound Blaster compatibility means games, games, games. —Leon Erlanger

Turtle Beach Systems, York, PA; 800-645-5640, 717-767-0200. (Reviewed: March 28, 1995, page 216.)

Circle 515 on reader service card

MAINSTREAM GRAPHICS ACCELERATORS

► Diamond Stealth64 Video 2201XL

Every year, we look at graphics accelerator boards and without fail, they get better and better and cheaper and cheaper. Good fortune certainly does prevail.

The best among 1995's crop is Diamond Multimedia's **Diamond Stealth64 Video 2201XL** (\$259). This S3 TrioV+—based 2MB EDO DRAM board produced some excellent WinBench 96 numbers and posted above-average performance on our real-world Winstone 96 tests. Diamond also gets high marks for packing this product with a supremely stable and powerful set of drivers and utilities. Stealth64 Video 2201XL

also performs digital video playback better than most other boards, and its impressive software bundle—which includes CorelDraw and Asymetrix's 3D-FX—makes it one of the best buys in boards around.

—Lance N. Ulanoff

Diamond Multimedia Systems Inc., San Jose, CA 95134-1922; 800-468-5846, 408-325-7000. (Reviewed: December 5, 1995, page 300.)

Circle 516 on reader service card

VIDEO CONFERENCING

► PicturTel LIVE PCS 50

Seeing live video of and talking with your coworkers and even relatives via PC sounds almost too good to be true—but it's not. Even so, like most emerging product categories we've examined, desktop video conferencing represents a maturing technology with products of varying quality and numerous, developing standards.

But of the ISDN-based solutions we tested, the \$2,495 **PicturTel LIVE PCS 50** offers the best bang for the buck. Its outstanding hardware-based compression and decompression technology delivers the best image quality, and its H.320 compatibility lets you communicate with videoconferencers from other vendors, including many room systems. And this packed PictureTel comes with excellent whiteboard software, LiveShare for true application sharing, and LiveLAN-V, a videoconferencing solution for LANs. —Leon Erlanger

PicturTel Corp., Danvers, MA; 800-716-6000, 508-762-5000. (Reviewed: December 5, 1995, page NE12.)

Circle 517 on reader service card

CD-ROMs

- Bob Dylan: Highway 61 Interactive
 - Microsoft TechNet CD
- The Magic School Bus Explores the Solar System
 - Corel Gallery 2
- A.D.A.M. The Inside Story
 - Great Artists

In 1995, the number of CD-ROM titles in print soared to almost 10,000—some good, some bad, some truly ugly. In our issue of June 27, 1995, we examined several hundred current titles and focused on content, resource requirements, and other criteria to pick the top 100 CD-ROMs. And six specifically stuck in our minds as the best of the best.

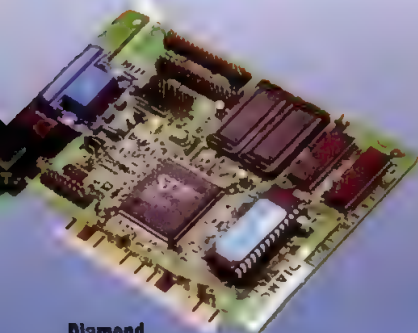
Graphix Zone brought us **Bob Dylan: Highway 61 Interactive** (\$59.95), a thoughtful tribute to Bob Dylan's career. The well-crafted interface is chock-full of hot spots. You click on the guitar to see song and album information, and a time line guides you through the artist's life and career. You can also see footage from Dylan's New York Supper Club performance and read early critical reviews.

Graphix Zone Inc., Irvine, CA; 800-828-3838, 714-833-3838. (Reviewed: June 27, 1995, page 142.)

Circle 519 on reader service card

Microsoft TechNet CD (single-user license, \$299; unlimited-user server license, \$699) turns your desktop into a help desk. A two-disk monthly subscription to TechNet gives you a not-too-technical compilation of the latest tips, information sheets, and drivers for Microsoft products and services. Disk 1 covers a variety of subjects, while the second disk provides

YEARBOOK Hard disk prices dipped below 25 cents per megabyte.



Diamond
Stealth64 Video 2201XL



Bob Dylan: Highway 61 Interactive





You

have work to do

and you run with it. Straight to **Windows® 95.**

You have **Microsoft Press,**

a big headstart, so you know what there is to know.

Know how to **get started.**

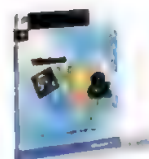
How to get around. How to get things done. You

and your work are up to speed fast. Gaining velocity.

Taking the lead.



The Ultimate Microsoft Windows 95 Book
A colorful, fact-filled guided tour loaded with hints and tricks
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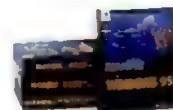
Traveling The Microsoft Network
Where to go, what to do, who to meet
ISBN 1-55615-817-3
352 pages, \$19.95



Microsoft Windows 95 Internet Kit
Software and instructions to get connected
ISBN 1-55615-885-8
200 pages, one 3.5-inch disk, \$29.95



Step-by-Step Guides
Self-paced training for busy people
Book and 3.5-inch disk, each \$29.95



Running Select Editions
Tips and strategies from the software experts
Each book \$29.95

Microsoft Press





 **GATEWAY2000**
"We've got a friend in the business."

the latest patches and updates to Microsoft products.

Not as techie as the Microsoft Developer's Network CD, TechNet provides answers for a wide range of questions. **Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080. (Reviewed: June 27, 1995, page 105.)**

Circle 521 on reader service card

Microsoft Corp.'s Windows-based **The Magic School Bus Explores the Solar System** (\$44.95) shows edutainment at its best—a mix of smarts, interactive detail, and plain old fun. You start off in a classroom with the sprightly teacher and students from the Magic School Bus PBS television and Scholastic book series. You can click around to see a goldfish that does gymnastics and a science project that actually explodes. And a trip to outer space intersperses stunning videos and facts with educational activities.

Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080. (Reviewed: June 27, 1995, page 138.)

Circle 520 on reader service card

You could never call Corel stingy. The company's **Corel Gallery 2** gives you 50 percent more clip art than the earlier version, plus 500 photos, 500 fonts, and sound and video clips—all for \$99. The ready-to-go artwork perfects business presentations, letters, reports, or anything where a picture enhances communication. If you need a particular piece of art, Corel has provided a logical tree-structured index—as well as thumbnails of each image—to assist in your search and selection.

Corel Systems Corp., Ottawa, Ontario, Canada; 800-772-6735, 613-728-8200.

(Reviewed: June 27, 1995, page 104.)

Circle 522 on reader service card

If you want to know everything or anything about the human body, A.D.A.M. Software, a company famous for its fine medical drawings, will give you a pretty good tour: Their Windows CD **A.D.A.M. The Inside Story** (\$39.95) revolves around The Anatomy Window, which lets you explore an optionally fig-leaved male or female body with a scroll bar that peels off skin and organs layer by layer. If you prefer a guided tour, you can follow Adam and Eve through their Family Scrapbook, a collection of narration, video, and animation that explains body processes.

A.D.A.M. Software Inc., Atlanta, GA; 800-955-9920, 619-549-0222. (Reviewed: June 27, 1995, page 110.)

Circle 523 on reader service card

Though not a museum, Attica Cybernetics' Windows-based **Great Artists** (\$59) offers an intriguing look at the lives and works of 40 major European artists. The CD uses images from the National Gallery's collection in London and presents one painting from each artist to explain such concepts as color, brush technique, and composition. It also provides hot-linked definitions for key terms, so you can instantly access the definitions for key artistic words such as brushwork, Renaissance, and abstract. You can also search the images by painting, artist, or theme. And a Trail feature lets you save and retrieve your list of sights for later visits.—Eryn R. Brown

Attica Cybernetics Inc., Chatsworth, CA; 800-721-2475, 818-882-9184. (Reviewed: June 27, 1995, page 158.)

Circle 524 on reader service card

REMOVABLE STORAGE

- Iomega Zip Drive
- ComByte DoublePlay

Picture this typical scenario: Your 1GB hard disk is nearly maxed out, but you want to keep all those PowerPoint presentations, video clips, e-mail, and .GIFs handy. Before you go through the hassle of upgrading your hard disk (only to see it fill up again), consider one of these two removable storage options that surfaced in 1995.

Iomega Corp.'s **Zip Drive** is almost as compact and just as portable as a personal CD player. Available in both SCSI and parallel-port versions (each \$240), the Zip Drive accepts proprietary cartridges that can hold either 25MB or 100MB of uncompressed data. Iomega's tools feature traditional back-up utilities as well as a cataloging option that keeps track of files on all your Zip cartridges. Notably, the Zip Drive's reasonably quick access time lets you conduct near-line storage of valuable but less-used files or transport multimedia presentations and other large files from computer to computer. And as the drive weighs only about 1 pound and sets up in a snap, you can carry it along to use on any PC.

Iomega Corp., Roy, UT; 800-697-8833, 801-778-1000. (Reviewed: June 27, 1995, page 50.)

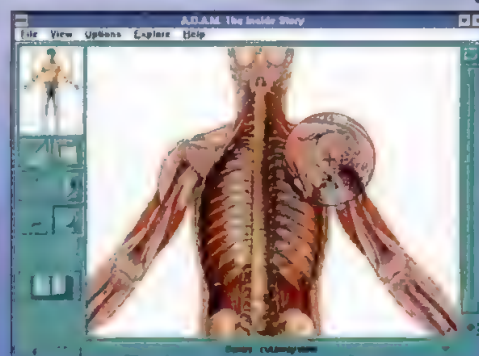
Circle 525 on reader service card

Another near-line storage option, **ComByte DoublePlay** dual-mode drive, piqued our interest in 1995. This affordable unit (\$159) fits a high-density 3.5-inch floppy disk drive and a .25-inch

YEARBOOK Most notebook vendors offered multimedia-ready systems.



The Magic School Bus Explores the Solar System



A.D.A.M. The Inside Story



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You'll find more than 100 new features on the latest version of Microcom's remote PC/network access software.

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CIRCLE 107 ON READER SERVICE CARD

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CIRCLE 153 ON READER SERVICE CARD

cartridge-tape drive into a single 5.25-inch floppy disk slot in your PC.

As a result, you get traditional tape storage, and you don't have to sacrifice a valuable bay or tolerate the painfully slow throughput of an external parallel-port drive. Even better, the DoublePlay automatically installs itself in your File Manager menu and supports true drag-and-drop. You can then use it as if it's a traditional floppy disk, so you don't have to learn how to use a dedicated backup software package. In addition, the drive can fit up to 500MB of uncompressed data on a standard QIC Wide tape, so you can off-load large files from your hard disk and still keep them as handy as any floppy disk-resident data.—*Jamie M. Bsales*
ComByte Inc., Ft. Collins, CO; 800-990-2983, 303-229-0660.

Circle 526 on reader service card

DEVELOPMENT TOOLS

- Borland Delphi for Windows
- Symantec C++
- Microsoft Visual Basic 4.0

Program developers always strive to build tools that let you easily mouse around from dialog box to application window and back. Good news for developers came in 1995: Brand-new tool upgrades made development almost a snap.

The most exciting new programming tool of 1995, Borland International's **Borland Delphi for Windows** (\$495) combines the intuitive ease of a visual programming tool with the power of a true compiler. You can easily create your program's forms—complete with command buttons, text boxes, scroll bars, and all the

other familiar widgets—just as you would in other visual tools. Delphi also lets you turn out applications in record time, since you can run and debug your program iteratively and on the fly from within the development environment. Under the covers, meanwhile, Delphi's optimizing compiler quickly converts your interface and source code to a lean machine-language executable or to a dynamic link library (DLL).

Furthermore, Delphi's Object Pascal-language base gives you a modernized, fully object-oriented model. You can use the rich set of Delphi component objects included with the product and inherit or modify their behavior with little effort. And if you want, you can even build new components without exiting Delphi. **Borland International, Scotts Valley, CA; 800-331-0877, 408-461-9195. (Reviewed: May 16, 1995, page 33.)**

Circle 527 on reader service card

Wisely, Symantec Corp. never tried to challenge the Microsoft Foundation Classes' authority as the bedrock of Windows C++ development. Instead, Symantec decided to hone its own offering to perfection. The result, **Symantec C++** (\$399), currently prevails as the fastest—and one of the most powerful—C++ development systems around.

Symantec C++'s Integrated Development and Debugging Environment (IDDE) gives you exemplary control over your projects. The ground-breaking and immensely helpful Class Editor lets you view and edit your class hierarchies even more readily than the error-free compiler does.

The compiler produced smaller, faster 32-bit executables more quickly on our

tests than any rival to date, and the slick Multiscope gives you state-of-the-art debugging techniques. You can even harness power from multiple networked systems to help create huge builds. All these features have put Symantec C++ a couple of leaps ahead of its leap-frogging competition.

Symantec Corp., Cupertino, CA; 800-441-7234, 408-253-9600. (Reviewed: October 10, 1995, page 310.)

Circle 529 on reader service card

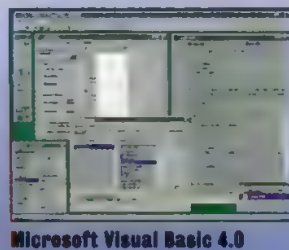
In 1995, Microsoft released **Microsoft Visual Basic 4.0** (Standard Edition, \$99; Professional Edition, \$499), a major upgrade that brings powerful new life and 32-bit status to this pioneer of visual development tools.

Much of the development environment still looks familiar, but Microsoft has torn up Visual Basic's old foundations and replaced them with OLE. The 16-bit VBX custom control format has been superseded by a new set of 32-bit OLE controls that you can put into new or existing projects. Visual Basic also allows you to build your own OLE automation objects that you can reuse many times, either in Visual Basic or in other OLE-enabled programs.

The high-end Enterprise Edition (\$999) even lets you distribute your OLE automation objects across physically separate networked systems, a revolutionary way to construct client/server applications. But despite all the new changes, Visual Basic still retains its intuitive approach to building and testing applications in record time.—*Thomas Mace*
Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080. (Reviewed: December 5, 1995, page 44.)

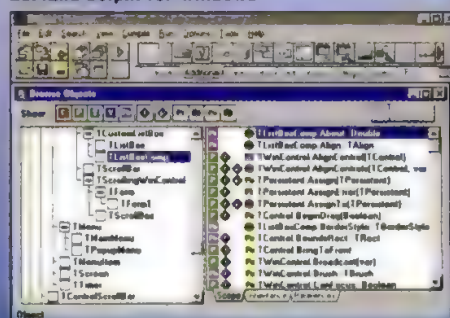
Circle 528 on reader service card

YEARBOOK Eager upgraders bought 1,000,000 copies of Windows 95 in four days.



Microsoft Visual Basic 4.0

Borland Delphi for Windows



THE TI EXTENSA 550CD. AT ITS PRICE, THE ONLY THING THIS MULTIMEDIA POWERHOUSE DOESN'T HAVE IS COMPETITION.

Choice of 10.4" Active Matrix or 10.4" Dual Scan display

640 x 480 resolution at 256 colors

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Full-motion video for dramatic sales presentations

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Powerful 75MHz Pentium processor

Integrated CD-ROM player (interchangeable with floppy disk drive or a lithium ion battery)

EXTENSA 550

- Integrated CD-ROM
- Pentium 75MHz
- PCI Bus architecture
- 256KB L2 cache
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- 1MB video memory
- 16-bit stereo sound card, microphone and speakers
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- Weight: 6.4 lbs.

Designed for

intel inside

pentium

Microsoft

Windows 95

Sure, you might find other portable multimedia machines priced like the new TI Extensa® 550CD, but they probably won't have Pentium® processors. And if they do, they're not likely to have a built-in CD-ROM. But that's just part of the TI Extensa 550CD's superiority. For better high-speed video and optimal performance for CD-ROM applications, the TI Extensa 550CD uses the same PCI circuitry found in most desktop computers.

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CIRCLE 368 ON READER SERVICE CARD



THE BEST OF

Abort, Retry, Fail?

As beloved entertainer John Davidson rebuilds his career after a tragic Photoshop accident, we pause to look back on the wackiest moments of the computing year just past.

By Don Willmott

THE 1995 ARF AWARDS

Most Aesthetically Displeasing Dance

At the Microsoft Windows 95 launch in August, CEO Bill Gates climaxed the ceremony by blasting the Rolling Stones' "Start Me Up" and forcing terrified VP Brad Silverberg into joining him in a halting, nerdy version of the Twist. No doubt Mick Jagger and Keith Richards were spinning in their graves. Oh, that's right: They aren't dead yet.

Worst Use of Lotus Notes

On February 10, *PC Magazine's* Lotus Notes server slowed to a crawl when *PC Magazine* staffers started duplicating countless copies of a Notes message containing a photo of Florence Henderson holding her favorite cooking oil. Now that's Wessonality!

Most Oxymoronic Product Name

The IBM OS/2 Family FunPak, complete with pogs.

Least Straightforward Switch Icon

NEC's PowerMate and Image PCs have a switch labeled like this: // . It's for setting the system to standby mode. When *PC Magazine* asked NEC how you were supposed to know whether it was for standby or reset, NEC responded, "Ideally, you'll make a note of it so you don't press it wrong."

Stupidest Rock Star Comment About High Technology

In April, the Associated Press quoted cyber-rocker Peter Gabriel admitting there were some situations technology can't help—such as setting the mood for a romantic evening: "It's not really as sexy to tell someone, 'Yes, you know, I've

Man Shoots PC, Hits Mac

OXFORD, Mich.—A self-described computer expert who wounded a neighbor after shooting his computer in frustration has waived his right to a preliminary examination.

James Tourville will be arraigned Feb. 17 on a charge of reckless discharge of a firearm. He faces up to 4 years in prison.

Gordon McIntosh, the neighbor, was being treated at Pontiac Osteopathic Hospital after doctors removed a bullet from his brain.

On New Year's Eve, Tourville was upset by rumors the auto plant where he worked would shut down, the breakdown of his van and a towel rack snapping in his hands. Police say he had been drinking beer and tequila.



Panty Raid Level 5!!!

Computrade International, a Taiwanese computer journal, had no compunctions about featuring this ad from Data Expert Corp. not once, not twice, but five times in the same issue (different panties in each ad, in case you're wondering).

The 1995 Nightmare Gallery

Some of this year's more inventive advertisements seemed to be designed specifically to trouble your slumber.



Microforum's fresh meat,



Adobe's genetic monstrosity,

Windows® 95 & Primal Rage have arrived!

No, no. See, Primal Rage is a game. Really.



Tonight at 8 (7 Central): "Redmond, 98052"

Just as the doomsayers predicted: According to this Target brochure, Windows 95 can control your TV set.

Five Rolling Stones Songs Not Associated with Windows 95



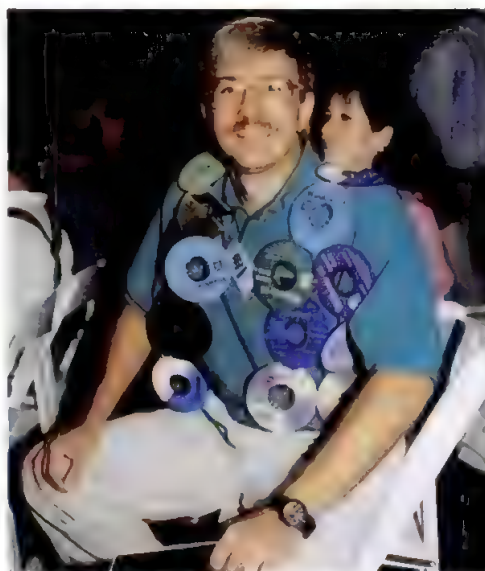
"Nineteenth Nervous Breakdown"
"You Can't Always Get What You Want"
"(I Can't Get No) Satisfaction"
"Complicated"
"Stop Breaking Down"

Vinnie Zuffante/Star File Inc.

Classified Ad of the Year

COMPUTERS — OTHER

\$39.00 full price, don't know what it is. I am not computer literate. Has screen, keyboard & other main piece. Lights up. Doesn't work. Peter 920-6894 It's old.



Another Happy Microsoft Investor—Get It?

Peter Helgren modeled his funky beta CD vest at the Windows 95 launch in August.

got all that stuff on my hard drive.' You want to have a few record sleeves lying around."

Most Unfortunate Sports-Related Software Advertisement

Microsoft signed up yachtsman Dennis Conner to pitch Excel with the slogan, "How can he lose in May when he's already 12.5 seconds ahead in January?" Unfortunately, the ad continued to run after Conner had been slaughtered by the Kiwis of New Zealand in the Americas Cup finals.

Downright Silliest Name for a Potentially Important New Product

Lotus NotesPump 1.0.

Hardest-Hitting Wall Street Analysis

The *Houston Chronicle* reported that "Netscape's debut was the most stunning Wall Street has seen since Boston Chicken went public in November 1993."

...And in a Related Development

IBM showed some real pluck by naming Boston Chicken's president as its chief strategist. Hey, it takes a tough man to make a tender.

Worst Use of Bill Gates in a TV Commercial

In August, Microsoft CEO Bill Gates starred in a Coke commercial in which he wandered the halls of Microsoft late at night looking for someone to loan him change for the Coke machine. It was a cute idea with one fatal flaw: Microsoft has a 20-year tradition of providing its employees with all the soda, coffee, and caffeinated beverages they can drink—free of charge.

Most Defensive Statement Made by a Spokesperson for a Potentially Obsolete Communications Medium in The Wake of the O.J. Verdict

In October, Newspaper Association of America president and CEO Kathleen Black said, "Newspapers—above all other media—provide the unprecedented ability to give readers in-depth coverage of breaking news like the O.J. Simpson verdict. Our medium will continue to provide readers a national and community sounding board to respond to the verdict by offering the public the ability to write letters to the editor and connect with important opinion makers."



Cardinal Technologies'. . .uh. . .cardinal,



Oracle's wizened toddler,



. . .and Oracle's branded babies.

"Absolute Necessity."

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"Eye Opening!"

"When I actually saw my project costs vs. estimates, I raised my rates immediately!"

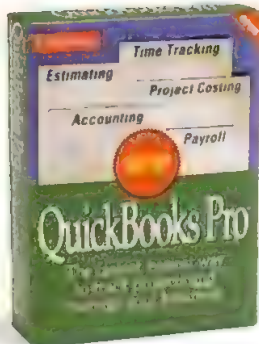
"A Giant Leap!"

"Integrates time tracking, estimating, and job costing with accounting and payroll. Finally, all my important business information is in one place!"

"Fast & Easy!"

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Announcing QuickBooks® Pro™, a breakthrough program that perfectly integrates time tracking, estimating, job costing, and payroll with the number one accounting software! **Save time.**

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have the information appear automatically everywhere you need to use it: invoices, paychecks, vendor payments, accounting records, and more. **Knowledge is power.** You'll have incredible control over every aspect of

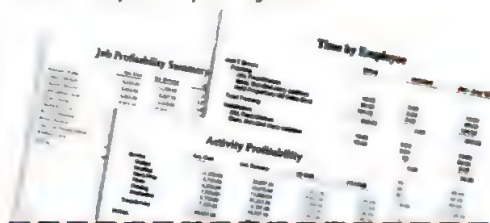
your business, from accounts receivables to materials expenses—take advantage of over 75 customizable reports and graphs, to always know what's going on. **It's Easy.** The screens look just like checks,

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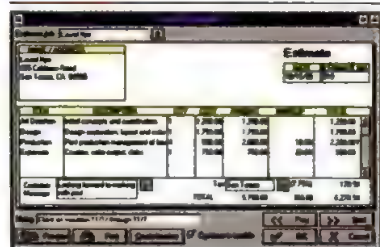
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From the makers of Quicken



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QuickBooks Pro makes Quicken, QuickBooks, and QuickPay data. **System Requirements:** Windows: 100% IBM compatible 386 or higher PC. Runs on Windows® 95 and Windows 3.1. 4MB RAM minimum. 8MB recommended. Hard disk with 15 MB free disk space. VGA or higher resolution monitor. Works with any printer supported by Windows 3.1 or higher. Mac: System 7.0 or higher and at least 4MB of RAM with a 68020 or faster processor. Recommended: 8MB RAM with a 68030-25MHz processor or faster, including IIcx, IIfx, IIfx, Centris, LC III, LC 520 or higher, Performa 450 or higher, and all Quadra and Power Macintosh machines. Hard disk with 15MB free disk space. Supports PowerBook, 12 inch or larger black and white, or 14 inch or larger color monitors with 640x400 resolution or better. Quicken and QuickBooks are registered trademarks of Intuit Inc. QuickBooks Pro is a trademark of Intuit Inc. © 1995 Intuit Inc. All rights reserved.

Sound and vision go hand in hand in today's multimedia PCs. It's time to trade in those tinny speakers that came with your system and start getting the full experience.



SPEAKERS: The Sound and the Fury

Gone are the days when PCs were mute. Today, computers tell you when you have e-mail, play music while you work, and sound the alert when your shields are failing in *Descent*. But most PC users are hearing it all through tiny, tinny speakers. Price-sensitive computer buyers will often find that a system's external speakers are the first budgetary victims, with most computer makers packaging underpowered "courtesy speakers" with their PCs. Such speak-

ers can cost manufacturers less than \$10, and they might enable you to make out the dialogue in a video clip. But when it comes to realism and sonic clarity, they're not much of a courtesy at all.

You can get much better sound out of your PC by adding your own set of multimedia speakers. For about \$100, there are speakers that offer a substantial improvement over your system's bundled speakers, enlivening games and multimedia reference works. Dis-

By John R. Quain

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Multimedia Speakers

criminating listeners and those who need multimedia speakers for a conference-room setting can find systems for \$200 to \$250 that approach the quality of home audio speakers. And the lunatic fringe can opt for \$600 PC speakers that rival professional studio monitors.

REVIEW CRITERIA

To help you find the speakers that are right for you, *PC Magazine* evaluated 25 external self-powered speakers designed for multimedia PCs. With list prices ranging from \$99 to \$339 (\$89 to \$270 street), the speaker systems in this roundup range from two-piece designs intended as low-profile desktop solutions to four-piece systems that come with their own external amplifiers and enough sound to fill a boardroom with Bach.

To weed out the companies that simply relabel cookie-cutter speakers being churned out in Taiwan and China, we required that a firm design and manufacture its own speakers. Our final list left 19 manufacturers, coming from both the PC and home audio markets. One major vendor that is not represented here is Reveal Computer Products (800-326-2222). The company is readying its Theatra line of multimedia speakers, which promises to command plenty of shelf space this holiday season, but evaluation units were not ready

in time for this review. Also, high-end home-audio maker Nakamichi will enter the PC-speaker fray in the near future.

There are sonic alternatives to conventional external speakers that we didn't review here. Several monitor manufacturers, for instance, now offer units with built-in stereo speakers. Unfortunately, these so-called multimedia monitors generally don't offer much audio improvement over the ones bundled with your PC. Because of their internal magnets, speakers can distort colors and images on your monitor if they are placed too closely to the display's sensitive components. Consequently, putting speakers inside a monitor means making some sacrifices.

Overall, we found that the variety and quality of multimedia speakers has improved tremendously in the last couple of years. There are solid low-end speakers from computer makers—such as NEC Technologies' AudioTower (\$99 list) and Yamaha's YST-M10 (\$149 list)—that are ideal for those trapped in the confines of a cubicle, mid-priced models like the Jazz J-902S (\$199.95 list) for those who have a little more room to test the audio abilities of their PCs, and top-notch speakers from traditional music-industry leaders, like the Roland MA-12CPs (\$259 list), for sophisticated MIDI multimedia users who can close

the door when they want to turn up the volume.

WHAT WE HEARD

To test the sonic abilities of the multimedia speakers in this roundup, we subjected each system to a suite of standard audio tests using an Audio Precision System One (APSO) signal analyzer. Those examining our performance test results should pay particular attention to the frequency response graphs. These charts reveal how close the speakers are to reaching the ideal of reproducing the entire audible range of sound, from 20 Hz to 20,000 Hz. Typically, most multimedia speakers can't reach below 40 Hz for low bass notes or go above 18,500 Hz for high notes. The other test result to focus on is the total harmonic distortion (THD). This number is a reflection of the overall distortion a speaker adds to the sound. Generally, any result under 1.0 percent is considered acceptable.

Still, shoppers should not rely on objective test results alone. Each person's hearing is slightly different, making judgments about the sound qualities of speakers a highly subjective affair. Furthermore, most speakers have their own personalities, emphasizing one area of the audible spectrum over another. So, to fully evaluate the speakers in this roundup, we put each set to a subjective jury test, using demanding music sources ranging from rock to classical symphonies. The results of the jury tests are discussed with the performance graphs as well as incorporated into the individual reviews, but buyers should audition speakers on their own before making a final decision.

WHAT TO LOOK FOR

Generally speaking, to get the best sound out of small speaker components, the way to go is with a three-piece design. Such systems include two smaller satellite speakers that can be placed on the desktop and are designed to handle midrange and high frequencies (from 150 Hz to 20 kHz). The third piece is the subwoofer, a lunchbox-size component that handles notes below 150 Hz. This combination of speakers usually delivers better overall frequency response. Be warned that setting up a three-piece system involves connecting more cables, though, and may not be convenient in tight quarters.

You should also consider how you're

HIGHLIGHTS

Multimedia Speakers

It has been said that the person who dies with the most toys wins. With multimedia options and extras for PC users increasing by the day, it is becoming more difficult to discern exactly who will come in first when it's all over. Good speakers are another nicety to take to the grave.

YOU WOULDN'T ride around in a Porsche with cheap tires, now would you? So why skimp when it comes to purchasing speakers for the multimedia kit you may have just purchased? Some vendors are currently offering speaker systems for under \$100 that plug directly into your sound card and amply fill a room with sound.

LOOK FOR a few basics when purchasing speakers. They should be magnetically shielded; otherwise they may interfere with the hard disk or monitor. They should deliver the best sound when placed a few feet apart; look for easy setup because you're probably upgrading for enhancement purposes and you won't want a tangle of wires crowding your desktop.

FOR THOSE WHO are serious about sound, some units come complete with subwoofers or equalizers. Those willing to pay more can fill an entire boardroom with sound or annoy their neighbors. Whatever your needs may be, your ears should ultimately make the decision.

going to use the external speakers. The three-piece systems, for example, usually have volume and power controls on the subwoofer, making them awkward to silence when the boss walks in. If you plan on using software to control the volume, this isn't a problem, but it can be a hassle if you like to tinker with the balance, treble, and bass controls.

Because most office arrangements dictate that your speakers sit next to or near your monitor, multimedia speakers need to be magnetically shielded to prevent interference with your display. All of the speakers in this review are shielded, but there is still the potential for problems with some systems. For instance, since subwoofers are designed to be hidden under users' desks, they are often not completely shielded.

Because sound cards offer only 4 watts of amplification per channel (at best) in addition to shielding, multimedia speakers need to contain their own amplifiers. In general, a built-in amplifier that delivers 10 watts per channel is enough to fill the average office with Strauss or 7th Guest. Some of the more expensive speakers we auditioned deliver 30 watts per channel, with enough volume to rattle the windows.

PSYCHED FOR PSYCHOACOUSTICS

Speaker vendors are also pushing some new sonic features this season. One challenge with multimedia speaker designs is to recreate the stereo sound image with speakers that are sitting only a few inches from the listener. Recently, several speaker makers have sought to overcome the problems of near-field stereo by adding so-called three-dimensional sound enhancement. Technologies such as SRS Surround (found on the NuReality Vivid 3D speakers reviewed here) and Spatializer (on the Labtec 3210 set) can add an element of vividness to games and recordings. Purists, on the other hand, may think that 3-D sound adds distortion and lacks a certain degree of sonic realism. (See the sidebar "Big Sound from

Audiophile/gamer

Multimedia Labs PC Amp-TC-1490-7SUB

Conference room

Advent Powered Partners AV622

Personal listening

NEC AudioTower Speaker System

Whether they are welcoming you to the working week or to a world of *DOOM*, there are myriad speakers for multimedia use out there. Let your ears decide.

For those looking for true home-stereo-quality audio in the workplace, the Multimedia Labs PC Amp-TC-1490-7SUB stands a little above the others. The four-piece system features a separate slimline amplifier with a five-band equalizer, a variable subwoofer slide control, and gold-plated jacks for an external microphone and headphones. With all these extras, plus great sound, the \$270 street price may not be too steep.

For unobtrusive yet high-powered speakers for a boardroom, the Advent Powered Partners AV622 (\$299 list) is our choice. This three-piece system produced some of the clearest highs and the fullest bass our jury heard. Even at half volume, the AV622s delivered enough sound to fill a medium-size room.

For those with more modest needs and budgets, the \$99 NEC AudioTower Speaker System garners an Editors' Choice as well. Sound was solid and consistent, and setup was extremely

low-maintenance. If you're a sucker for a pretty face, the AudioTower's attractive design proves impressive for business presentations.

Finally, several systems merit honorable mention. The Altec Lansing ACS-300.1 (\$249 street) delivered crispness and depth. Atlantic Technology International's Multimedia System (\$270 street) received accolades from several jury members for tight musical reproduction. Cambridge SoundWorks' outstandingly precise audio monitors lost points for finicky setup. For MIDI work, consider the powerful Roland MA-12CP (\$259 list). The Yamaha YST-SS510 garnered high signs from several jurors for warm and gentle sound reproduction.

At the low end, close runners-up were the Altec Lansing ACS52 (\$99 street), Audio-Technica MMS557 (\$100 street), and Yamaha YST-M10 (\$100 street). Any one should suit your needs and your budget.



Little Boxes" on the following page for a discussion of three-dimensional sound technologies.)

When considering your multimedia speaker options, remember to keep in mind what you'll be using them for and

where, and how much you've already invested in your multimedia PC. If you are just going to be playing video clips and the occasional narration, you don't need to spend more than \$100. Those who work in an open office setting, on the other hand, shouldn't worry about how many watts of power the speakers have and should look for models with up-front headphone jacks instead. In the end, though, no matter what your multimedia needs, you'll find speakers that are right for you in this roundup.

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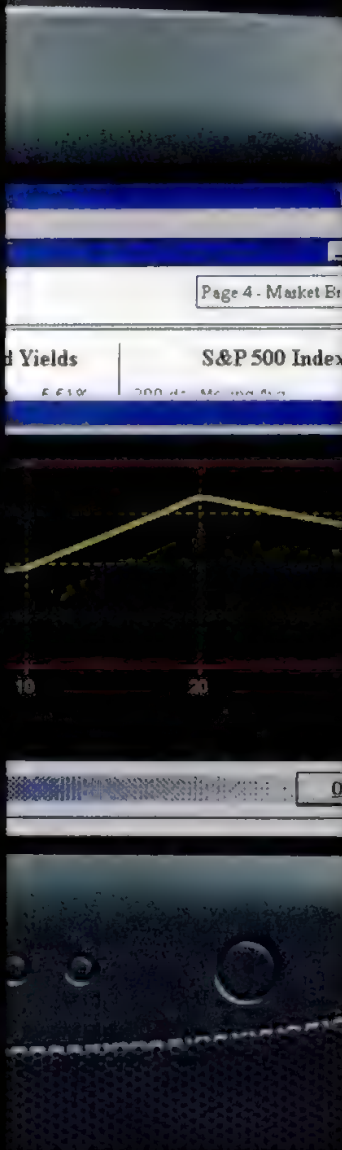
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Big Sound from Little Boxes

By William Dyszel

Moviegoers are already accustomed to being immersed in a thrilling and realistic field of sound that transforms the experience of filmgoing from an imaginary situation into a believable adventure. Many of the technologies that have been used for years in movie theaters are now finding a market in sound peripherals for the PC.

So-called three-dimensional sound enhancement is one of the hottest tickets around, and is being incorporated into speakers and sound cards, and encoded directly into multimedia software. Though they take different approaches, the various 3-D sound technologies have the same aim: to enhance the multimedia experience by expanding the perceived sonic image of sound beyond the two speakers sitting aside your monitor. Ambitiously, manufacturers strive to place and move the sounds associated with on-screen objects in 3-D space, so they appear to be next to you, behind you, or wherever appropriate.

To attain this, manufacturers can either bounce soundwaves around so they really *are* coming from next to or behind you, or manipulate the left and

right channels of traditional stereo to make your brain *perceive* that sound is coming from elsewhere. Home theater systems typically offer surround sound with five-speaker setups at a hefty price, but PC sound vendors have developed some clever approaches that promise convincing sound without breaking the bank.

ENCODING AND ALGORITHMS

Altec Lansing is taking the first approach. Its ACS500 speaker system is the first to offer Dolby Pro-Logic, the home version of Dolby Surround Sound found in many movie theaters. Employing only front speakers plus a subwoofer, the \$450 ACS500 is among the most expensive sets of PC speakers around (see the sidebar "Spending More: What Price Fidelity?"), but their innovative approach to speaker construction could be the start of a trend. Altec's design takes advantage of the small "sweet spot" to which PC users confine themselves when sitting at a computer. By deftly angling speakers in a specially designed cabinet, Altec Lansing allows the listener to perceive some of the sound to be coming from behind.

Taking advantage of Dolby Pro-Logic,

though, requires that multimedia titles be preencoded with the Dolby effect. Some game designers are already planning to incorporate Dolby Surround Sound encoding in their games and will suggest that you use suitable speakers for best results. Also, with the future melding of PC and home-entertainment media brought on by the unified DVD standard, Pro-Logic may make more inroads into PC applications. Right now, though, Pro-Logic multimedia titles have not quite arrived.

The next level of technical trickery relies on the fact that there are many cues your brain interprets to determine the location of a sound. For instance, a sound will reach the ear closer to the sound source microseconds sooner than it will reach the ear farther away (a phenomenon called *time delay*). It will also be louder in the closer ear (*intensity delay*). These, plus the subtle frequency shifts (or *phase shifts*) caused by how sound is funneled by your outer ear into the ear canal, let the brain place most sounds in three dimensions. Enter QSound, Spatializer Audio Laboratories, and SRS Labs. These companies have patented algorithms that approxi-

continues

3-D Sound: Placing Objects in Space

In traditional stereo sound, left and right channels combine to create a stereo image. Better speakers can create a larger perceived soundstage, so sound seems to emanate from a few feet behind the moni-

tor. Sound can have a much wider presence with 3-D technologies. Dolby Surround Sound and QSound must be encoded on the media to achieve this, while Spatializer and SRS can be added to speakers and

sound cards via a processing chip. Music and sound effects appear to come from points in the room far from the speakers. Objects (such as jets) seem to move in space toward and then past the listener.



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Dell's featured artist is Wendy Grossman of New York, NY.

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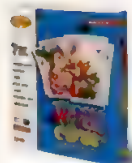
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Big Sound from Little Boxes, continued

mate these complex aural processes to create the "psycho-acoustic" effect using standard stereo signals.

QSound, pioneered in the professional recording industry, is perhaps the most precise of the three. Popular recording artists who have used QSound include Madonna, Pink Floyd, and Sting. QSound can also be implemented in software,

as it is in the Jaguar and Sega game systems, to give the realistic sense of being surrounded by sound. Under the right circumstances, QSound makes you hear a sound as if it were coming from beside you or behind your head. Game programmers can make an engine roar seem to move along with a plane flying past, or make a monster's breathing approach from behind. Your ear will be so sure of the location of the sound that you can literally point to it. For best results, you must be positioned properly between the speakers and your speakers must be balanced and in phase (QSound has made several demo files available on its CompuServe home page).

The drawback is that QSound must be implemented when the sound is originally mixed; you can't add QSound after the fact. Some game manufacturers now are including QSound encoding on their popular titles, and some of the techniques will be offered as a part of high-end PC audio editors such as Sonic Foundry's Sound Forge. But as with Pro-Logic, the use of QSound technology is hardly pervasive.

THE AFTERMARKET APPROACH

More likely to wind up on your desktop is technology from Spatializer or SRS. These two companies offer

processing chips to sound board and speaker makers that add dimensionality to any multimedia application or audio CD. The processors analyze the differences between the left and right channels of a stereo audio track, and attempt to recreate what the programmers intended in three dimensions.

While these schemes do create impressive sound, their effect is limited to increasing or decreasing the perceived distance between various sound sources; they are less adept at localizing a sound source far from the speakers. Also, though gamers will likely be thrilled by the expanded sound field, audio purists may find the distort-

ed sound stage an annoyance.

Still, Spatializer and SRS, along with a new offering from QSound called QxpanD, are the easiest ways for manufacturers to deliver 3-D sound to a ready audience. Several speaker manufacturers are including stereo expansion in their products this year, and more will follow. We looked at the Labtec LCS-3210 speakers (which employ Spatializer technology) and the NuReality Vivid 3D set (which feature SRS) in this speaker roundup. By the time you read this, International Jensen (makers of Jensen and Advent products) will have its \$199 JPS453D speakers, featuring the company's own 3-D sound chip. In case you don't want to replace your speakers, Labtec and NuReality offer small standalone boxes that you can connect between your sound card and speakers to add the 3-D enhancement. A number of motherboard manufacturers, including NEC and Packard Bell, are also incorporating 3-D sound into upcoming designs.

Spatializer and SRS, along with a new offering from QSound called QxpanD, are the easiest ways for manufacturers to deliver 3-D sound.

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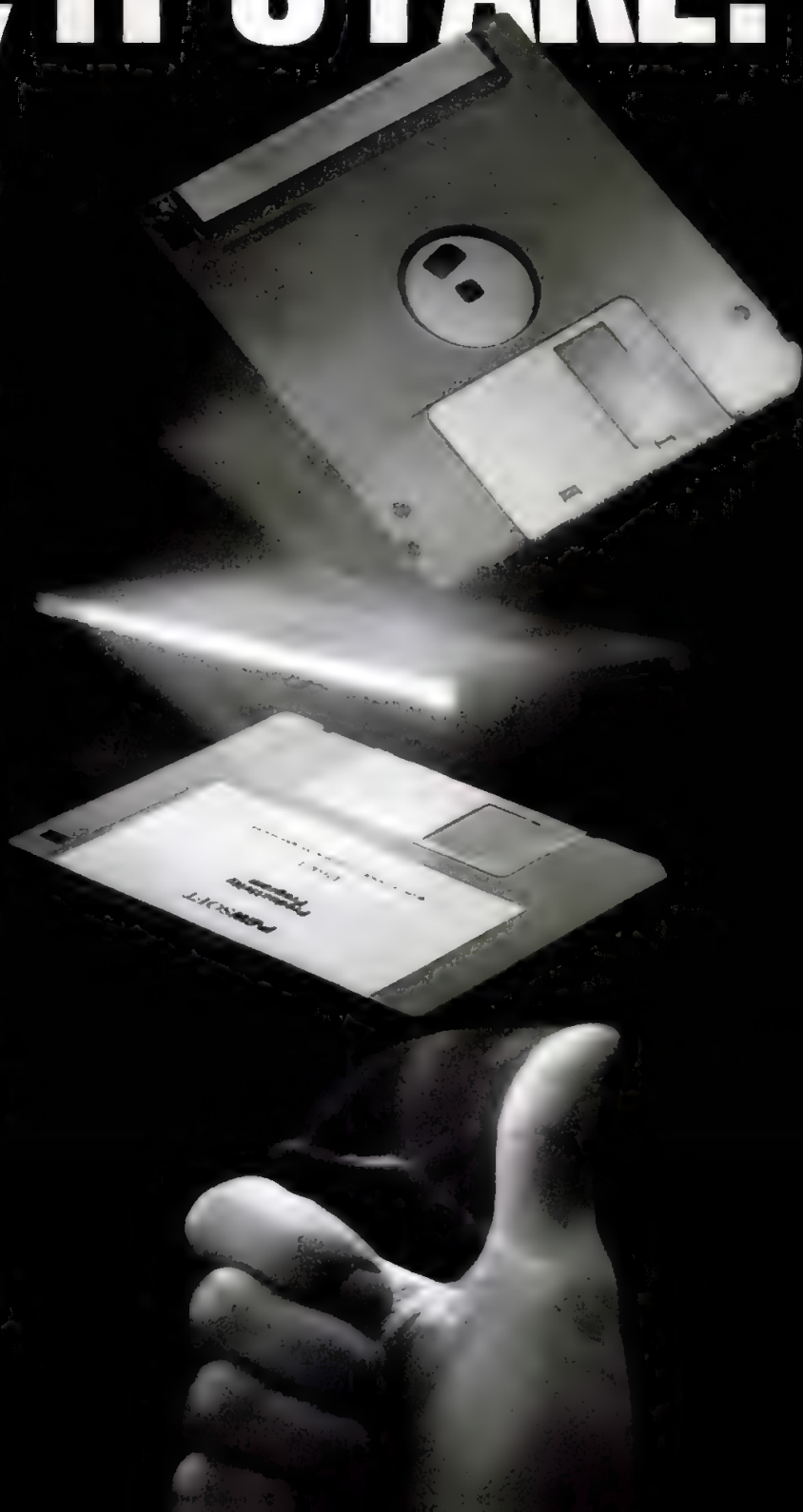
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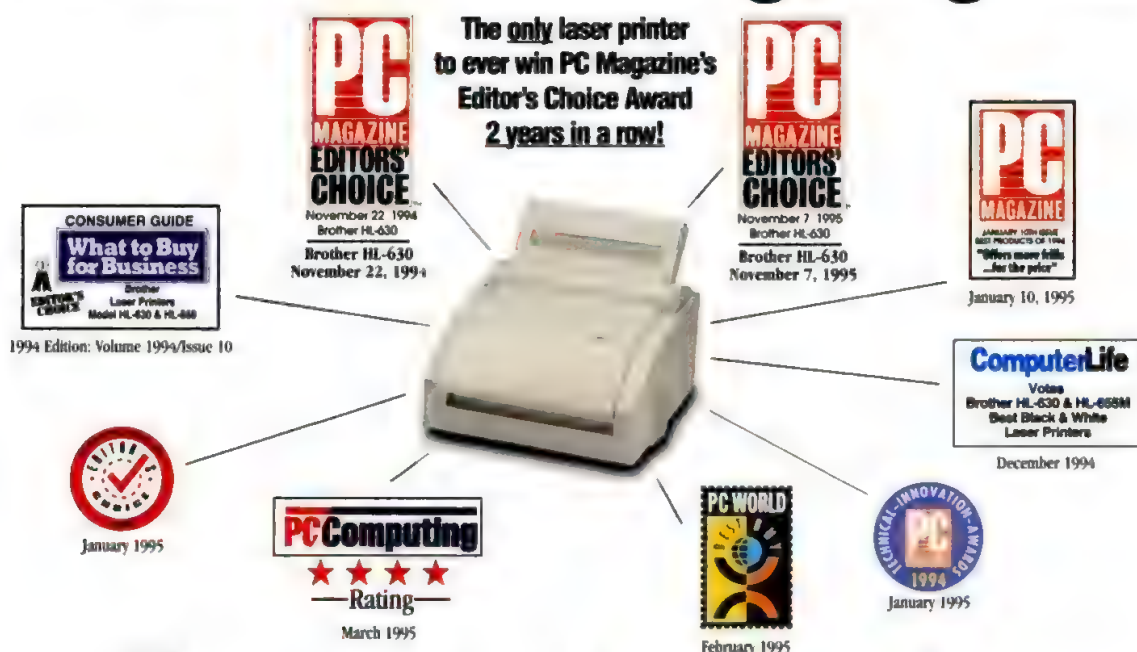
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CIRCLE 036 ON READER SERVICE CARD

Multimedia Speakers

Advent

**Powered Partners AV170,
Powered Partners AV622**

The two sets of Advent speakers we reviewed fall at opposite end of the spectrum. The affordable Powered Partners AV170 (\$129 list) are suitable for cubicle workers and those with less pressing sonic demands.

The top-of-the-line Powered Partners AV622 three-piece set (\$299 list) delivers outstanding sound quality and enough punch to fill a large conference room.

The wedge-shaped AV170s are a snap to set up. However, Advent has placed the headphone jack on the back and the speakers provide for only one audio source. The pair exhibited excellent stereo imaging—better than other speakers in their price class—and good bass presence. The AV170s showed weakness at the high end, though: A bit of raspiness was discernible.

The AV622s were much more impressive. The satellites are tiny, though the subwoofer is large—about the size of a footstool. The sound was superb. Music was crisp, with clean highs and full bass. At half volume, it filled a large room with sound and showed no hint of clipping. If you want an unobtrusive sound system for a corporate conference room—or if you



Advent's Powered Partners AV622 speakers prove more than able to blast coworkers right out of their cubicles.

want complaints from your office neighbors—buy the AV622.—*Jamie M. Bsales*
Powered Partners AV170. List price: \$129. **Powered Partners AV622.** List price: \$299. Advent, a division of International Jensen, 25 Tri-State Intl. Office Cir., #400, Lincolnshire, IL 60069; 800-477-3257; 708-317-3700; fax, 708-317-3836.

Circle 445 on reader service card

Altec Lansing Technologies Inc.

**Altec Lansing ACS52,
Altec Lansing ACS300.1**

As one of the first speaker companies to bring quality audio to the PC, Altec Lansing has a reputation to defend. Stacked up against several excellent choices in this roundup, the company's popular ACS300.1 three-piece system (\$300 list, \$249 street) still offers high-fidelity sound at a competitive price. For those on a tighter budget and with less demanding needs, the ACS52 speakers (\$128.50 list, \$99 street) deliver reasonable performance for typical multimedia use.

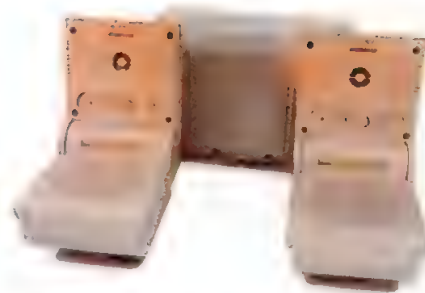
With its distinctive clamshell-style satellite speakers and under-the-desk subwoofer, the ACS300.1 offers office workers flexibility and clear sound in an unobtrusive package. Up front are convenient power, volume, balance, treble, and bass controls.

On both objective and subjective tests, the ACS300.1 compared favorably with other speakers, revealing an open and clear sound even during particularly demanding musical passages. We did notice distortion at higher volumes, though.

If you're more inclined to need speakers for game effects rather than for listening to Mozart's greatest hits, then the ACS52 speakers are an economical choice. This pair of conventional desktop speakers includes necessities like an up-front volume control, treble and bass adjustments plus rear panel mini-jack connectors for headphones, two stereo sources, and a subwoofer (\$150 list). You sacrifice some convenience with the ACS52s—there's no on-board control for mixing the two sound sources together, for example—and the speakers lack some lower bass and high treble response.

In our listening tests, the ACS52s sounded a bit thin on high treble symphonic passages, while some rock music lacked the sonorous bass of systems equipped with a subwoofer. On the other hand, we found these speakers delivered a good sense of stereo separation in desktop settings.

Within their price range, the ACS52s offer acceptable sound for most multimedia tasks. For those with more fastidious listening habits—and who eschew blasting rock through their offices—the Altec Lansing ACS300.1 system still stacks up well



With its familiar clamlike satellites, the Altec Lansing ACS300.1 three-piece system delivers quality sound with a unique design.

against other models.—*John R. Quain*
ACS52. List price: \$128.50. **ACS300.1.** List price: \$300. Altec Lansing Technologies Inc., P.O. Box 277, Milford, PA 18337-0277; 800-648-6663; fax, 717-296-1222.

Circle 446 on reader service card

Apple Computer Inc.

**AppleDesign Powered
Speakers**

For \$139 (\$99 street), the AppleDesign Powered Speakers deliver decent sound quality in a no-frills box. Intended for general purpose PC multimedia and gaming, the Apple speakers are easily installed, and have controls for volume, balance, and power on/off. Their design is relatively attractive and simple. But with the low price come compromises: The Apple's low-end response was sorely lacking, and there are no spatial effects to widen the perceived stereo field.

Apple fared pretty well in analyzer tests, with a frequency response that ran from 47 Hz up to 18.6 kHz. But despite the respectable analyzer test numbers, the

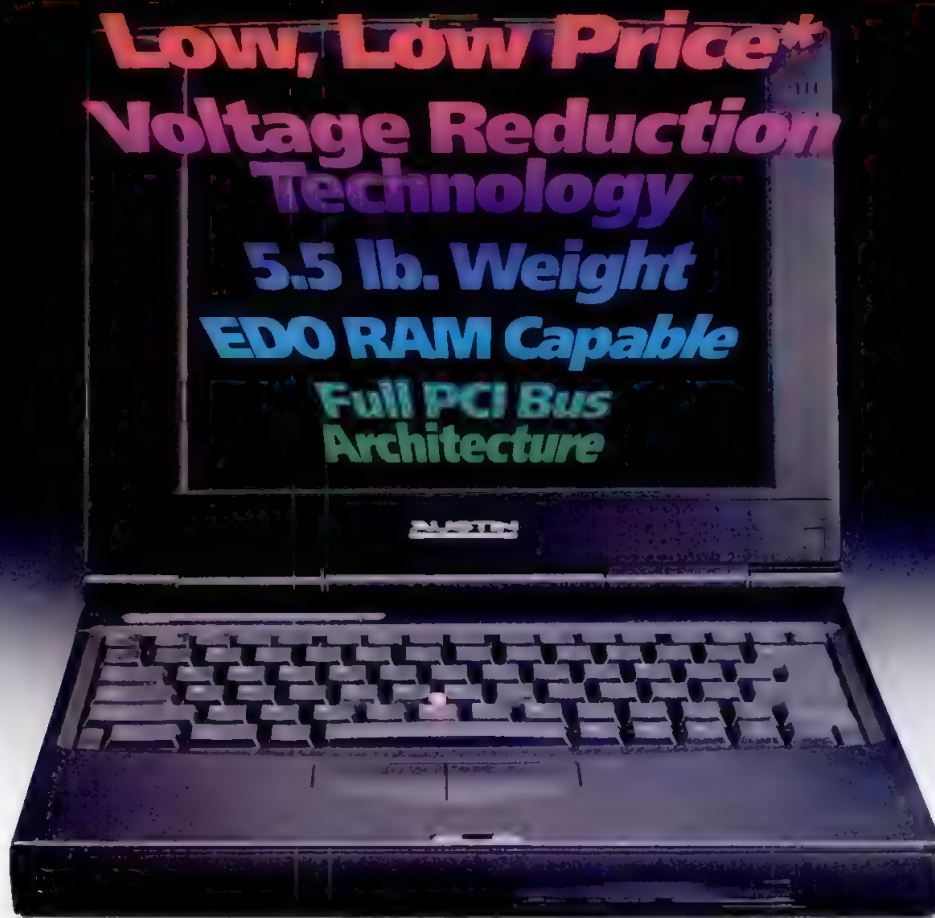


Not the best of the bunch: The AppleDesign Powered Speakers emerged far from the top of the performance tree.

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PC Magazine, Editor's Choice Awards, May 30, 1995 Issue



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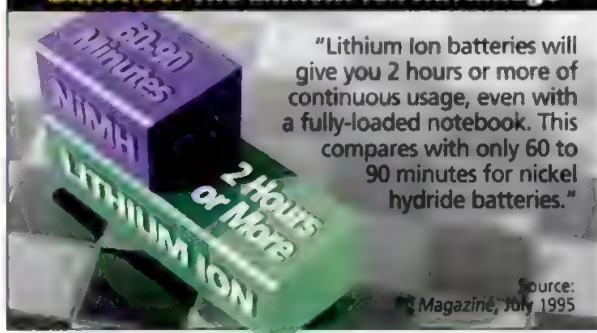
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Spending More: What Price Fidelity?

By Craig L. Stark

Although games and business presentations probably top the multimedia-applications charts, we also auditioned three speaker systems designed specifically for the serious and well-heeled audiophile. These were the Altec Lansing ACS500 Surround Sound Computer Speaker System with Dolby Pro-Logic (\$450), the Bose Corp. Acoustimass (\$699), and the Yamaha YST-SS1010 (\$349.95). All three reproduce the nondirectional bass frequencies with separate subwoofers that fit under your desk.

NO TOWERS OF BABLE

The statuesque Altec Lansing ACS500 is a full 18 inches tall, and its desktop drivers are angled to project in three directions. Each unit contains two 3-inch midbass drivers, one 1.3- by 2.5-inch midrange, and a 0.5-inch dome tweeter; the 6.5-inch subwoofer has a 40-watt amplifier rated at 0.8 percent THD. The satellites pump out an impressive 22.5 watts. One of the satellites contains controls for volume, center ("presence"), surround, and subwoofer, and the under-desk unit has an additional volume control. To help balance the output from this array, a push button turns on a pink-noise signal that automatically cycles through the drivers in sequence. An additional pushbutton switches between regu-

lar stereo and a built-in Dolby Pro-Logic decoder that, when playing appropriately recorded sound tracks, produces cinema-like surround sound without requiring rear-mounted speakers. (For the full surround effect you must sit in the "near field"—within about 2 feet—of the desktop units.)

The tiny (3 by 3 by 4.8 inches) desktop cubes of the Bose Acoustimass system contain 2.5-inch wide-range drivers that are driven by 20-watt amplifiers; the 5.3-inch driver inside the bass module has a 50-watt equalized amplifier. The unit has overall volume, treble and bass controls and an additional pair of input jacks, but there is no way to control the balance between the satellites and the bass unit. Bose cautions that putting the cubes less than 4 feet away may cause the sound to seem shrill.

The left and right faces of the Yamaha satellites look like a pair of curvacious hips. One unit contains a volume and presence control (± 7 dB above 10 kHz) and a power on/off button; the subwoofer has an addition-

al volume control, a hi/low cut filter, and a power switch. The subwoofer amplifier is rated at 25 watts, with 10-watt-per-channel amplifiers in the desktop units. To spruce up the sound—literally—the speakers use pure spruce pulp rather than plain paper cones.

To check the "surround sound" feature of the Altecs, we listened to the Dolby Pro-Logic sound track from *Apollo 13* (MCA). While the latter certainly sounded more spacious than the usual stereo reproduction and was full of strikingly directional effects, it did fall short of achieving a full four-channel effect.

THE BEST OF THE BEST

Overall, however, while all three systems sounded better than most home stereo systems, the Altec was easily this writer's choice. Full dynamic and frequency range, with no audible distortion or coloration, they stood out when playing all types of music. The depth and width of the sonic image was astonishing: Timpani seemed to come all the way from the fireplace at the end of the room and choral diction and Steinway piano clarity were outstanding. The Bose and the Yamaha tied for honorable mention, their faults being a slight tendency toward stridency (Bose) and a warm mellowness that tended toward a slightly muted, boxy sound (Yamaha).



Apple speakers sounded flat. Overall, the sound was muddy and ill defined and lacked clarity in the midrange frequencies, though high frequencies came through. With rock music, the overall mix sounded two-dimensional, lacking any sense of background and foreground. The most noticeable shortcoming was the lack of any low-end punch. Gaming audio sounded only slightly better, since the Apple speakers could achieve loud vol-

ume levels without clipping.

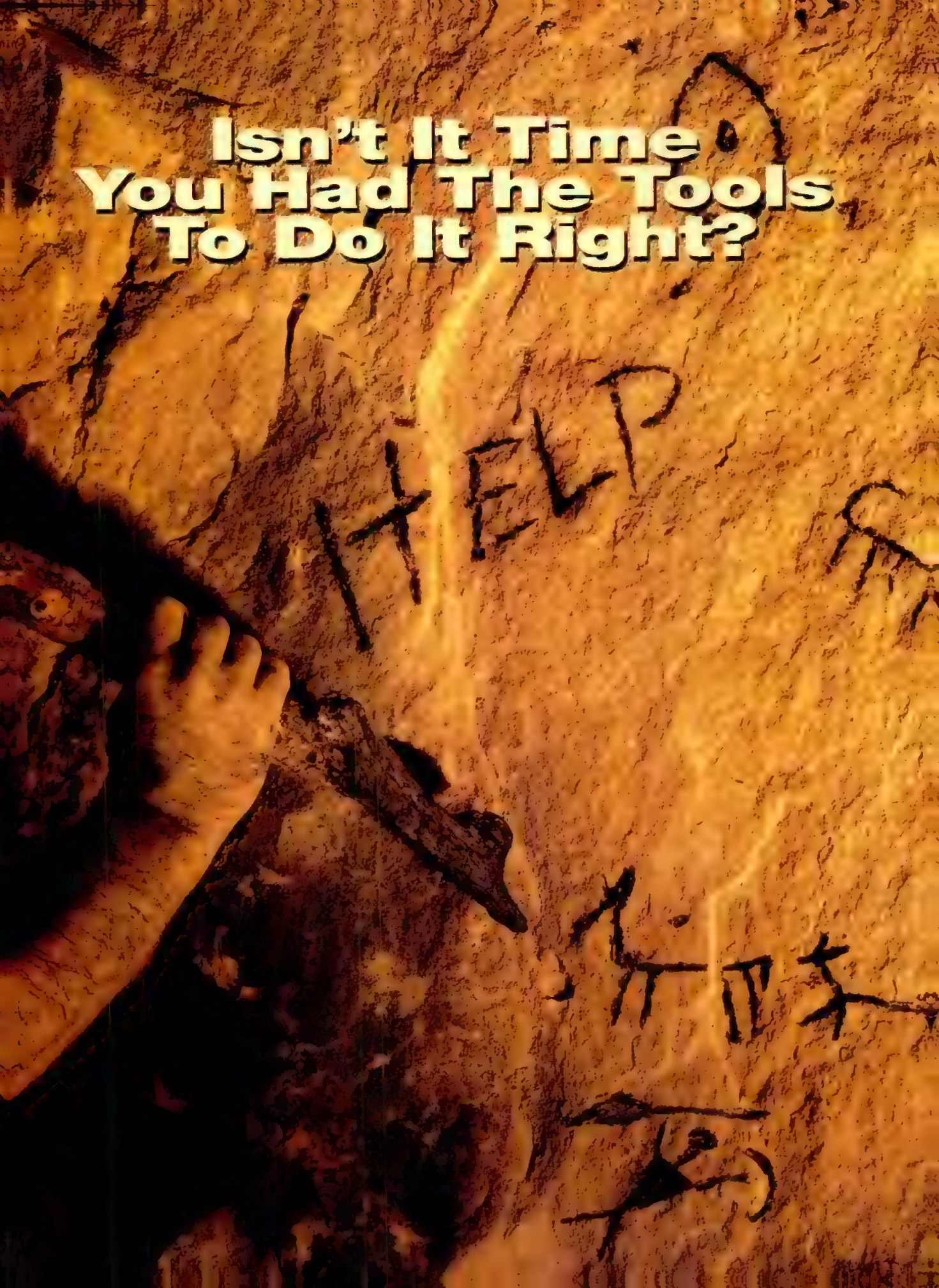
If you're currently running your PC audio through the bundled paper cups that came with your sound card, the AppleDesign Powered Speakers will be an inexpensive improvement.—*Dave Salvator*
AppleDesign Powered Speakers. List price: \$139. Apple Computer Inc. One Infinite Loop, Cupertino, CA 95014; 800-538-9696.

Circle 447 on reader service card

Atlantic Technology International **Multimedia System**

Known primarily for its home theater surround sound speakers, Atlantic Technology has leveraged its experience in consumer electronics to produce a solid, reasonably priced three-piece speaker system for computer users. The Multimedia System (\$348 for the set, \$249 on the street) has enough power to fill a

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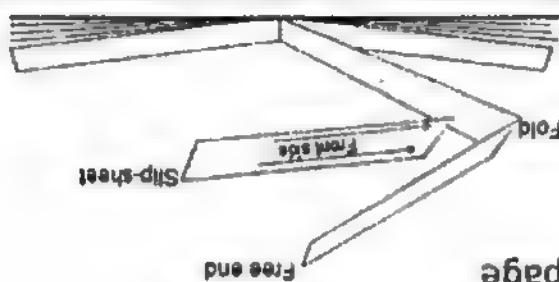
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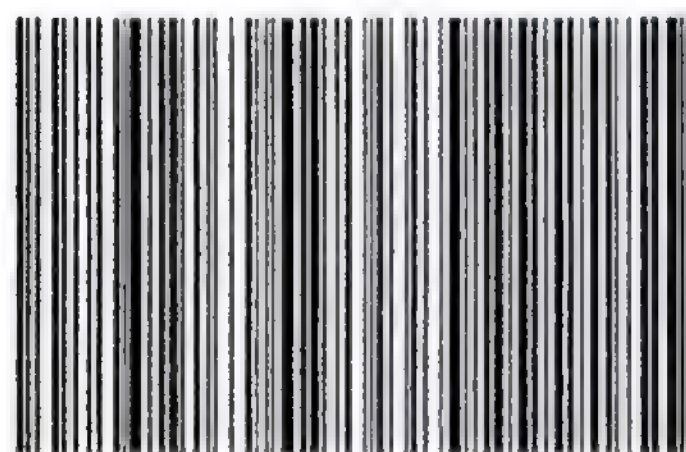
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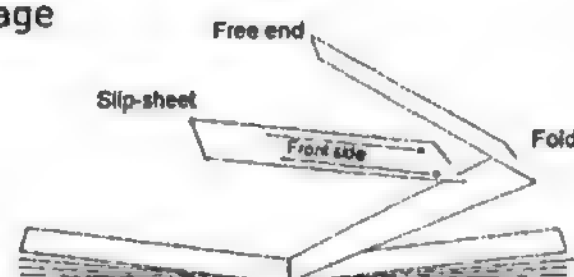


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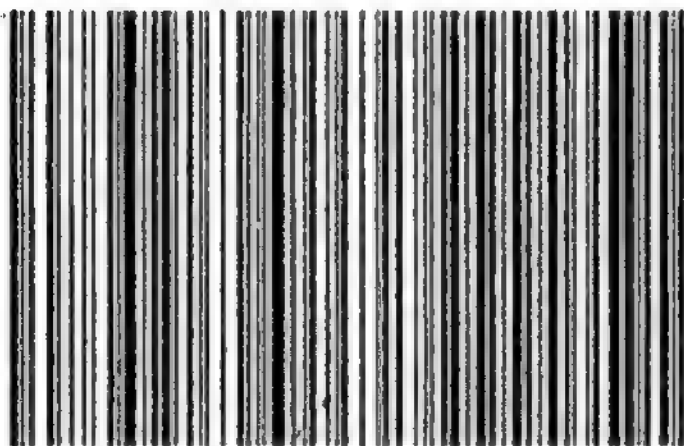
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compliant, meaning they can power down and use less energy.

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75MHz \$1595**

Package #1:

- ▶ 8MB EDO RAM
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- ▶ 3.5" 1.44MB FDD
- ▶ Diamond Stealth 64 PCI local bus graphics card/1MB DRAM
- ▶ 14" SVGA color monitor
- ▶ 6-bay desktop case
- ▶ Microsoft Mouse
- ▶ MS Windows 95
- ▶ MS Works 95

**Pentium Processor
75MHz \$1895**

Discovery™ MM:

The above system modified to include:

- ▶ 4X CD-ROM drive
- ▶ Sound Blaster™ 16 sound card, stereo speakers
- ▶ 15" SVGA color monitor
- ▶ 14,400 bps send/receive fax modem
- ▶ MS Works 95 Multimedia CD



Pantera™

Pentium Processors

75MHz	\$2545
90MHz	\$2695
100MHz	\$2745
120MHz	\$2845

Hottest:

- ▶ 16MB EDO RAM, 256K synchronous SRAM cache
- ▶ 1.2GB local bus EIDE hard drive
- ▶ 4X CD-ROM drive, 3.5" 1.44MB FDD
- ▶ Diamond Stealth 64 Video PCI local bus graphics card/2MB VRAM
- ▶ 15" SVGA color monitor
- ▶ 6-bay desktop case (75MHz)
- ▶ 10-bay vertical case (90MHz, 100MHz & 120MHz)
- ▶ Microsoft Mouse
- ▶ MS Windows 95
- ▶ MS Office Pro 95 & Bookshelf™ 95 CD



Pantera™

Pentium Processors

75MHz	\$3345
100MHz	\$3445
133MHz	\$3645

Best MM:

- ▶ 24MB EDO RAM, 256K synchronous SRAM cache
- ▶ 1.2GB local bus EIDE hard drive
- ▶ 4X CD-ROM drive, 3.5" 1.44MB FDD
- ▶ Sound Blaster™ 16 sound card, stereo speakers
- ▶ Diamond Stealth 64 Video PCI local bus graphics card/2MB VRAM
- ▶ 17" SVGA color monitor
- ▶ 10-bay vertical case
- ▶ Microsoft Mouse
- ▶ MS Windows 95
- ▶ MS Office Pro 95 & Bookshelf™ 95 CD

Pentium Processors

100MHz	\$4145
120MHz	\$4245
133MHz	\$4345

Best MM Supreme:

The above system modified to include:

- ▶ 32MB EDO RAM, 256K synchronous SRAM cache
- ▶ 1.6GB local bus EIDE hard drive
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- ▶ Sound Blaster™ AWE32 sound card

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75MHz \$1695**

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- ▶ On-board PCI local bus SVGA color video
- ▶ 14" SVGA color monitor
- ▶ 4-bay desktop case
- ▶ Microsoft Mouse
- ▶ MS-DOS and Windows for Workgroups
- ▶ MS Office Pro



Meridian™ 400

**DX4-100
\$2095**

Package #3:

- ▶ 8MB RAM
- ▶ 350MB IDE hard drive
- ▶ External 3.5" 1.44MB floppy drive
- ▶ 14.4 PCMCIA fax/modem
- ▶ 7.9" dual-scan color VGA display
- ▶ Custom leather carrying case
- ▶ Extra battery
- ▶ MS Windows 95
- ▶ MS Works 95
- ▶ 7.8" x 10.2" x 1.7"; 4.1 lbs.

For active matrix display, add \$700.



Meridian™ 850

**Pentium Processor
90MHz \$4095**

Package #3:

- ▶ 16MB RAM, 256K synchronous SRAM cache
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- ▶ Internal 3.5" 1.44MB floppy drive
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- ▶ External amplified speakers
- ▶ 28.8 PCMCIA fax/modem
- ▶ 10.3" dual-scan color SVGA display
- ▶ Custom nylon carrying case
- ▶ Extra battery
- ▶ MS Windows 95
- ▶ MS Office Pro 95
- ▶ 8.9" x 11.7" x 2.1"; 6.8 lbs.

For active matrix display, add \$700.

*Orders must be for "Computers Now!" configurations; we've listed just a sampling here. Since we continuously update these "CNI" configurations, please call to confirm your system is on the list. This offer is good only as long as these pre-built systems remain in stock. Other ZEOS systems and configurations may take slightly longer—about a week. All orders are subject to credit approval. Monitor upgrades available on desktop "Computers Now!" packages. Orders must be received by 11:00 a.m. Central Time, Monday-Friday.

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CIRCLE 155 ON READER SERVICE CARD

Multimedia Speakers



Atlantic Technology presents the M110 Multimedia speaker set with the M105 Powered Subwoofer.

room with smooth sound, making it ideal for larger office settings.

The Multimedia System's desktop M110 satellite speakers (\$119 list if purchased separately) can accept two stereo inputs. For full bass response, the satellites connect to the M105 Powered Subwoofer (\$229 list), which has its own 45-watt amplifier and separate volume control with a switchable crossover (130/100 Hz) to accommodate other types of satellite speakers. Listeners will find the Atlantic three-piece system a carefully tailored setup that's suitable for a variety of music and multimedia tasks. Despite a rather high THD test result of 1.9 percent, our jury listening tests found the Multimedia Speaker System to be a competent performer. If anything, the Atlantic system sounded slightly flatter or "colorless" compared with other three-piece systems.

On the other hand, many buyers will appreciate Atlantic's rather restrained approach and tight musical reproduction. If you are looking for a three-piece system to deliver reasonable high-fidelity sound in a typical office setting, don't overlook the Atlantic Technology M110/M105 Multimedia System.—JQ

Multimedia System. List price: \$348. Atlantic Technology International, 343 Vanderbilt Ave., Norwood, MA 02062; 617-762-6300; fax, 617-762-6868.

Circle 448 on reader service card

Audio-Technica U.S. Inc.

Audio-Technica MMS557

At \$150 (about \$99 street), Audio-Technica's MMS557s may be one of the best buys in this roundup. Audio-Technica comes to the multimedia speaker market from the audio world, where they've made microphones and other audio

gear for years. The MMS557s can deliver excellent overall sound for both music and gaming, with clear and crisp midrange and high-frequency performance, and beefy bass response.

The MMS557s feature a two-way, ported design and include stands that lift the speakers about 2 inches off your desktop. The MMS557s don't require much desktop real estate, but

they offer only one line-level input, so you'll have to route all your audio first through your sound card.

On our listening tests, we had to crank up both the treble and bass settings to about 90 percent of maximum to liven up their overall sound. But after this adjustment, the MMS557s delivered excellent definition and clarity. Their ability to convey a sense of background/foreground in listening to a jazz recording was very impres-



The Audio-Technica MMS557 speaker set had no problems delivering strong bass and vocals.

sive. In playing back a heavy-handed funk recording, the MMS557s didn't falter, delivering that same clarity, and also very rich bass response.—DS

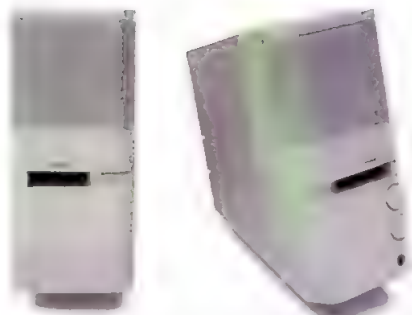
Audio-Technica MMS557. List price: \$150. Audio-Technica, 1221 Commerce Drive, Stow, Ohio 44224; 216-686-2600; fax, 216-688-3752.

Circle 449 on reader service card

Bose Corp.

Bose MediaMate Computer Speakers

Bose has built its successful reputation with unorthodox loudspeaker designs that have won accolades in the home stereo world. The company's two-piece Bose MediaMate Computer Speakers (\$339 list) deliver very clear definition



From a company better known for superior home stereo, the compact Bose MediaMates deliver so-so sound.

in the midrange and higher frequencies. They achieve their clarity without the use of any spatial enhancement effects, and while their crisp definition was impressive, their low-end response left us underwhelmed at times.

Like other Bose loudspeakers, the MediaMates come in an unusual package. Their wedge-like shape points the speakers more directly at your ears. In distortion tests, the MediaMates placed toward the bottom of the pack, with 1.2 percent THD, in large part because of the MediaMates's use of only one full-range speaker per side instead of a two- or three-way speaker design. Still, the MediaMates sounded clear playing music, especially in the midrange and higher frequencies. And while they delivered more bass response than expected given their size, a subwoofer would deliver that extra low-end punch. Game audio also delivered the same clarity, but the low-end wasn't quite there.

True to the Bose name, the MediaMates deliver clean sound for both music listening and gaming audio. But the \$339 price tag is steep considering the lack of a subwoofer.—DS

Bose MediaMate Computer Speakers. List price: \$339. Bose Corp., The Mountain, Framingham, MA 01701; 800-444-2673.

Circle 450 on reader service card

Cambridge SoundWorks Inc.

SoundWorks

Of all the speakers reviewed, the Cambridge SoundWorks speaker system may offer the best high-fidelity sound for the lowest price—\$219.99. But SoundWorks' idiosyncratic design presents some drawbacks during setup.

Available directly from the company

In evaluating multimedia speakers, we're actually looking at two separate pieces: a power amplifier and then a loudspeaker system. With home stereos, analysts test these components individually, but since multimedia speakers are "all-in-one" units, we evaluated both units together.

Jury Analysis: How the Speakers Sounded

To determine how good the various systems actually sound, we supplemented the objective measurements of our West Coast lab with a panel of editorial staffers who rated the audio quality of each system subjectively. Our main criteria were frequency response range and smoothness, freedom from distortion, and the width and depth of the sonic image.

Each system in turn was set up on the computer desk of an acoustically good home-listening room/office that contained its own first-rate stereo system for comparison. The units were adjusted to produce exactly the same volume level, using pink noise and a Sound Pressure Level meter. A group of CDs was then played through each system, and notes were made of the jury members' comments. The test selections included "Limehouse Blues" (Jazz at the Pawn

Shop, Proprius Records), "Kiss from a Rose," (Seal, Sire Records), the introduction (with a 38-Hz organ pedal) to *Also sprach Zarathustra* (perhaps better known as the theme from *2001: A Space Odyssey*), and Mozart's Piano Concerto no. 21 (both from Technics Digital Inspection Vol. 2). While many of the systems garnered the response, "sounds like many others," a few stood out, both pro and con.

With but one dissenting vote, the Roland MA-12CP (\$259 street) earned the highest jury marks for its overall clarity on all types of multimedia sound. Equally good was the impressive four-piece Multimedia Labs PC Amp-TC-1490-7SUB (\$299.95 list). It exhibited a deep sound stage, with excellent clarity. The Advent AV622 (\$299 list) had a very rich, live sound that was hard to believe coming from such tiny desktop speakers. (Its subwoofer unit, however, was larger than an average VCR.) The Cambridge SoundWorks (\$219.99 list) was compact and very clean-sounding but sonically seemed a little cold. The Atlantic Technology Multimedia System (\$348 list) had power to fill the largest room, but its sound was somewhat colorless.

Among the less expensive models, "snappy," "crisp," and "clean without being strident," were the comments used to describe the Altec Lansing ACS52 (\$128.50 list) when listening to rock, though enthusiasm waned when we turned to classical selections. On these, the sound stage audibly narrowed. The Jazz J-590 (\$89 street) and NEC AudioTower were judged sonically solid for their price. The Yamaha YST-M10 (\$99 street) projected a warm, rich sound with a good spatial localization, but slightly less impressive bass (a subwoofer is available separately).

Similarly, the Koss SW/150 had a clean, open sound when playing jazz, but the rock selection revealed a hole in the frequency range, and the speaker had little depth of image and was somewhat muddy when playing classical music. The Koss HD/100 had a more open sound and created a little air around the instruments.

STEREO AND BEYOND

If conventional stereo sound seems too tame, you might want to consider one of the systems that included a sound-enhancing chip designed to improve your sense of space. The NuReality Vivid 3D speakers, which employ SRS's technology, drew comments that ranged from "wow" to "nauseating." One panelist noted that the speakers made a clear, classical Steinway piano sound as if it were going through a synthesizer. The Spatializer-equipped Labtec LCS-3210, seemed to work best with games; with orchestral selections it seemed to put the individual musicians on one another's laps.

The losers in our survey were the RadioShack AMX-16s (\$119.99), which were simply judged "bad, period." Worst of all was the wireless Recoton WC430 (\$249.99): The remote-control tuning was never able to eliminate a

TOTAL HARMONIC DISTORTION

Lower scores represent better performance.	Satellites (percent)	Subwoofer (percent)
Advent Powered Partners AV170	0.5	N/A
Advent Powered Partners AV622	0.4	1.1
Altec Lansing ACS52	1.6	N/A
Altec Lansing ACS300.1	0.7	6.7
AppleDesign Powered Speakers	0.5	N/A
Atlantic Technology Multimedia System	1.9	10.1
Audio-Technica MMS557	0.9	N/A
Bose MediaMate Computer Speakers	1.2	N/A
Cambridge SoundWorks	0.6	9.3
Jazz J-590	0.3	N/A
Jazz J-902S	0.3	6.8
Koss HD/100	0.4	N/A
Koss SW/150	0.2	0.4
Labtec LCS-3210	2.6	N/A
MIDI Land MLI-95	0.3	N/A
Multimedia Labs PC Amp-TC-1490-7SUB	0.3	0.3
NEC AudioTower Speaker System	0.6	N/A
NuReality Vivid 3D Speakers	0.3	N/A
RadioShack AMX-16	1.4	N/A
Recoton WC430	0.5	N/A
Roland MA-12CP	0.3	N/A
Sony SRS-PC50	0.9	N/A
Sony SRS-PC300D	0.7	4.2
Yamaha YST-M10	0.3	0.6
Yamaha YST-SS510	2.3	0.6
Average	0.8	4.0

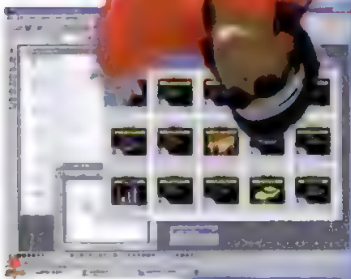
N/A—Not applicable: This system does not include a subwoofer.

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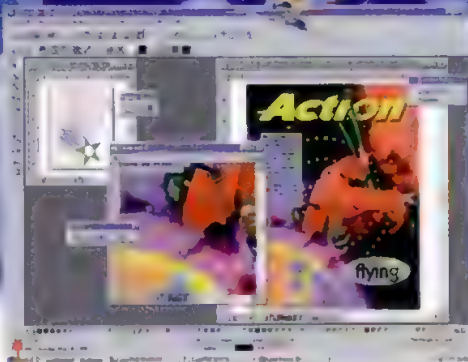
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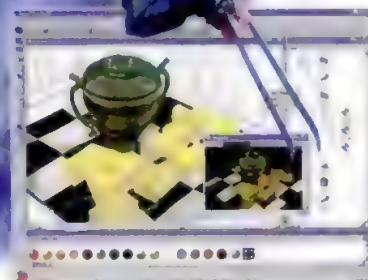
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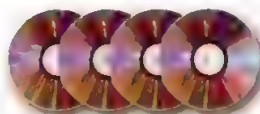


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large component of AC hum from the speakers, the battery chamber rattled, and the sound was branded "horrific."

—Craig L. Stark

Objective Tests: Generating the Numbers

We conducted our suite of objective tests using an Audio Precision System One (APSO) signal analyzer. The APSO served as both signal generator and signal analyzer in all tests. We tested all units in a semi-anechoic chamber using a Brüel & Kjær 4007 microphone at a measuring distance of a half-meter. For lower-frequency measurements, (300 Hz and lower) we used a near-field measurement, placing the microphone about a half-inch from the speaker.

In preparing the speakers for testing, we first calibrated by injecting a 1-kHz (100 Hz for subwoofers) sine-wave test tone at 1 volt root mean squared (Vrms) into the speaker's line-in. We then adjusted the speaker's volume control until we were reading 90-dBspl (decibels sound-pressure level) output. After the initial calibration, we ran full-spectrum pink noise (which sounds like radio hiss) through the speaker for about 2 minutes to warm up the unit's cones and drivers. Next, we verified the unit's 90-dBspl calibration.

Frequency Response: Frequency response indicates the range of the audible spectrum that a speaker can cover. If a

unit has very poor low- or high-end response, the shortcoming will be readily apparent to your ears. We tested with Audio Precision's Maximum Length Sequence (MLS) methodology,

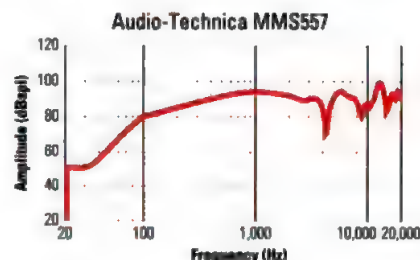
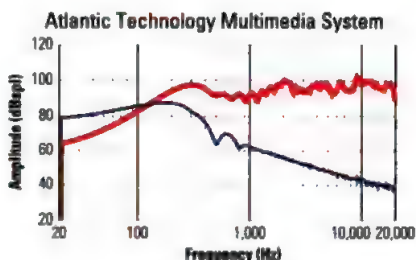
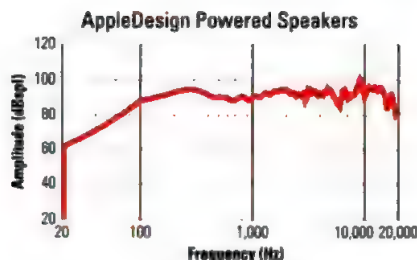
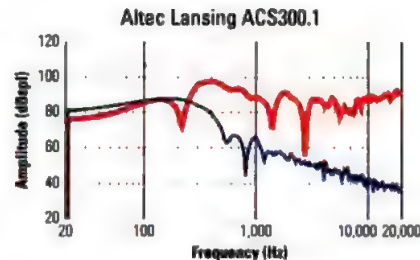
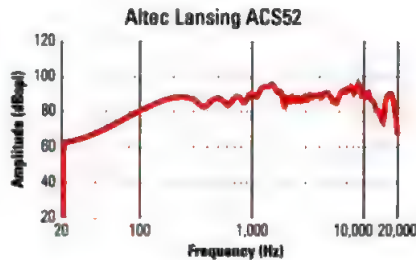
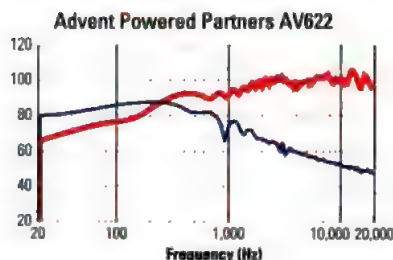
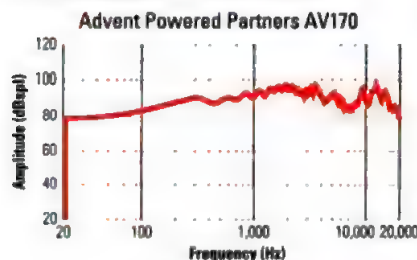
which uses a pseudo-random pink noise impulse signal. MLS's main advantage is that the test signal is a full-spectrum (20 Hz to 20 kHz) signal where there is simultaneous signal energy across the spectrum, more like a real-world music or audio signal. We considered a speaker no longer to be responding when its dBspl level was 6 dB below the dBspl level of the reference frequency (1 kHz for satellites and all-in-one units, and 100 Hz for subwoofers). The frequency response graphs show two different measurements, half-meter and near-field. From 20 Hz to 300 Hz, normalized near-field data is displayed, and from 300 Hz to 20 kHz, half-meter data is displayed. A multimedia speaker's response should run at least from 150 Hz to 18 kHz.

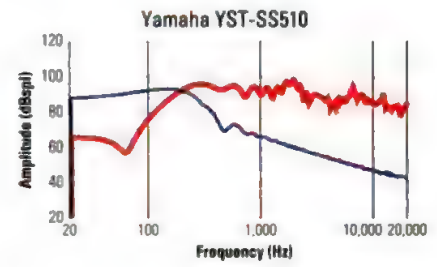
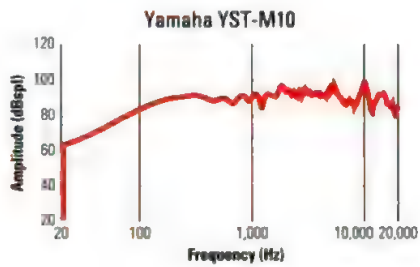
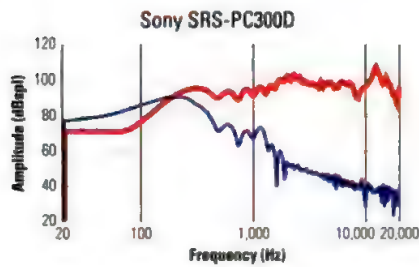
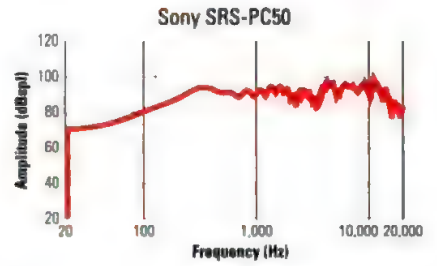
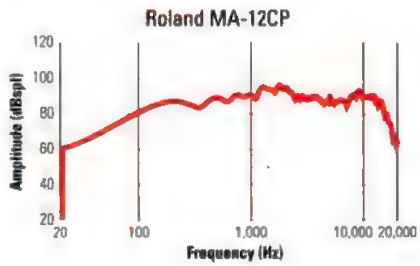
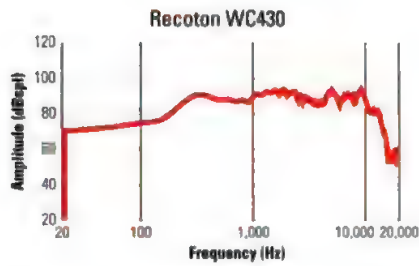
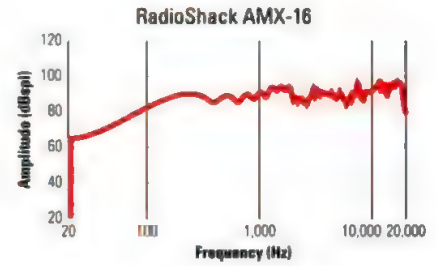
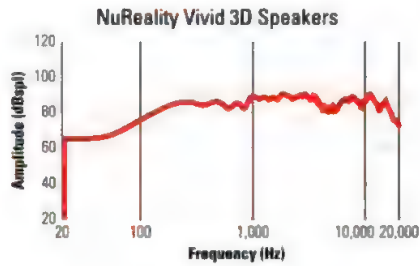
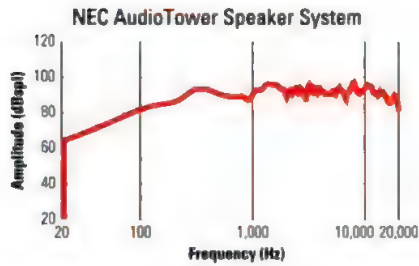
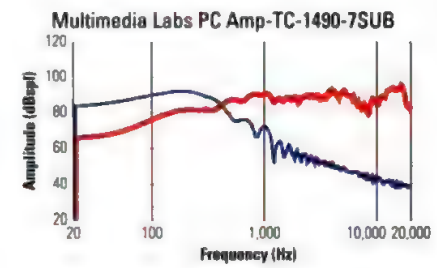
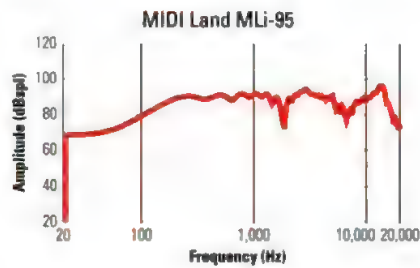
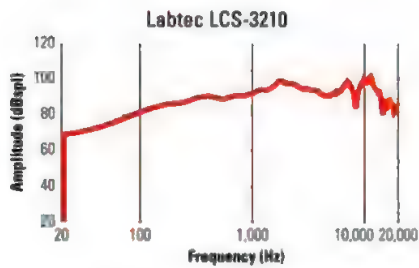
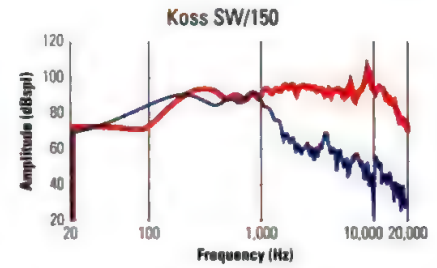
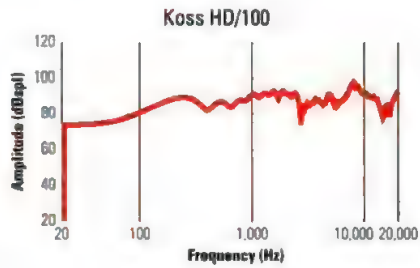
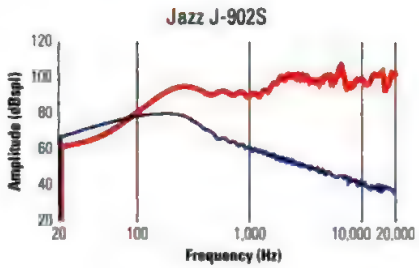
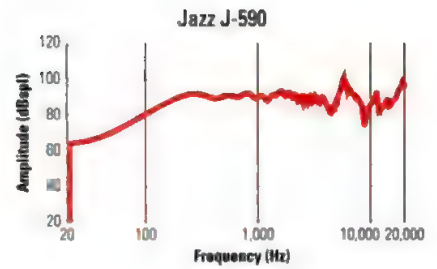
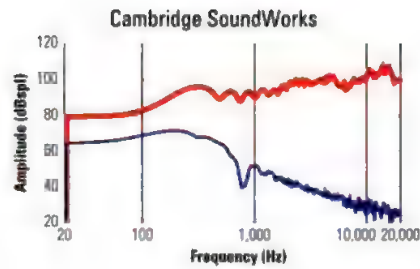
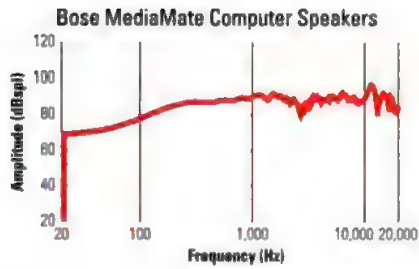
Total Harmonic Distortion: To measure THD, we used a five-tone test signal (fundamental frequencies: 70 Hz, 270 Hz, 1,020 Hz, 3,920 Hz, and 15 kHz). We first measured the amplitude of the five fundamentals, then measured the amplitude at each of their harmonic frequencies (2nd through 5th order). We calculated the percent THD by taking a root mean square (RMS) sum of the harmonic amplitudes, and dividing that by the RMS sum of the fundamentals' amplitudes. Unlike line-level audio equipment, it's not uncommon to see THD values well over 1 percent for multimedia speakers, although the lower the percent THD, the better.

Maximum Gain: We used sine-wave test tones at seven different frequency points (50 Hz or lowest responding frequency, 100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, and 15 kHz or highest responding frequency) across the spectrum, and while keeping the input signal at a constant 1 Vrms, increased the speaker's volume until we read 10 percent THD+ noise (THD+N). We then recorded the dBspl level at the time the unit went into 10 percent THD+N. A speaker should be able to output at least 90 dBspl throughout most of the spectrum before hitting 10 percent THD+N.—Analysis written by Dave Salvator

FREQUENCY RESPONSE CURVES

— Satellite — Subwoofer





SUMMARY OF FEATURES

Multimedia Speaker Systems

PC MAGAZINE
EDITORS' CHOICE

■ YES ■ NO

In alphabetical order by company

	Advent Powered Partners AV170	Advent Powered Partners AV522	Altec Lansing ACS52	Altec Lansing ACS300.1	AppleDesign Powered Speakers	Atlantic Technology Multimedia System	Audio- Technica MMS357
List price/Vendor's estimated street price	\$129.00, N/A	\$299.00, N/A	\$128.50, \$99	\$300.00, \$249	\$139.00, N/A	\$348.00, \$249	\$150.00, \$99
Speaker dimensions (HWD, in inches)	7.1 x 5.1 x 5.9	5.5 x 3.8 x 3.5	4.5 x 4.9 x 9.1	5.3 x 7.1 x 8.3	9.3 x 4.5 x 4.8	7 x 4 x 4.3	9 x 5.5 x 6
Output power (continuous, per channel)	3 watts	8 watts	8 watts	9 watts	12.5 watts	3 watts	10 watts
Subwoofer dimensions (HWD, in inches)	N/A	6 x 16 x 12.8	N/A	5.4 x 10.5 x 7.3	N/A	N/A	N/A
Output power (continuous)	N/A	30 watts	N/A	18 watts	N/A	N/A	N/A
Subwoofer model (and price) if available separately	AV522 (\$199.00)	None	ACS250 (\$150.00)	None	None	M105 (\$229.00)	None
Dimensional sound enhancement	None	None	None	None	None	Proprietary	None
Claimed frequency response (±3 dB)	145–20,000 Hz	50–20,000 Hz	60–20,000 Hz	35–20,000 Hz	90–18,000 Hz	40–18,000 Hz	80–20,080 Hz
Volume control location	Satellite	Subwoofer	Satellite	Satellite	Front panel	Satellite, subwoofer	Satellite
Bass/treble controls	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Balance/presence controls	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Headphone jack	■	■	■	■	■	■	■
Secondary input source	■	■	■	■	■	■	■
A/B input switch	N/A	N/A	N/A	■	■	■	N/A
Warranty (parts and labor)	2 years	2 years	1 year	1 year	1 year	2 years	1 year
Toll-free technical support	■	■	■	■	■	■	■
Technical-support hours (eastern time)	9:30–6:00 M–F	9:30–6:00 M–F	24 hours, 7 days	24 hours, 7 days	9:00–9:00 M–F	10:00–5:00 M–F	N/A
Web address	None	None	None	None	http://www.apple.com/	None	None
Internet address	None	None	75361.351@compuserve.com	75361.351@compuserve.com	None	None	consumer@atus.com

N/A—Not applicable: The product does not have this feature.



Although their setup was a bit tedious, the Cambridge SoundWorks' sonic accuracy is worth the aggravation.

and through a few retail outlets, the SoundWorks system offers sonic accuracy to those seeking a home stereo sound in their office. The SoundWorks comes with two unassuming satellite speakers and an under-the-desk subwoofer. On the subwoofer you'll find the primary controls and connections, including a power switch, bass level control, and stereo audio inputs.

Cambridge has also added a separate volume control dial to the cable that connects the subwoofer to your sound card. However, the owner's manual warns users

about connecting the speakers to a high input sound source, such as the variable volume output on some sound boards. The speakers are extremely sensitive and can generate severe distortion if misused. In hands-on tests, we discovered that even with the in-line volume control set at its minimum, the SoundWorks could not be used with some portable CD players without overdriving the speakers.

When properly connected, the Cambridge SoundWorks system is remarkably clean and accurate, reproducing classical music passages with confidence. However, in subjective jury tests, some listeners found the SoundWorks' sonic personality antiseptic and cold. These aren't the speakers for rough and tumble MIDI work or for joystick jockeys, but if you've got a finicky ear, and are willing to live with Cambridge's sensitive setup, the SoundWorks represent a good value.—JQ

SoundWorks. List price: \$219.99. Cambridge SoundWorks Inc., 311 Needham St., Newton, MA 01468; 800-367-4434; fax, 617-332-9229.

Circle 451 on reader service card

Jazz Inc.

Jazz J-590,
Jazz J-902S

Jazz Inc. is building a strong reputation in the multimedia speaker market, thanks to systems such as the two we listened to. Both the two-piece Jazz J-590 (\$149.95 list, \$89 street) and three-piece Jazz J-902S (\$199.95 list, \$140 street) are good values, with above-average sound for their price classes.

Thanks to the bass-reverb design and



With their shiny black appearance and easy setup, the Jazz J-902s produced above-average sound for their price class.

HARDWARE

Multimedia Speakers

Continues

Bose MediaMate Computer Speakers	Cambridge SoundWorks	Jazz J-590	Jazz J-902S	Koss HD/100
\$339.00, N/A	\$219.99, N/A	\$149.95, \$89	\$199.95, \$140	\$99.99, N/A
7.4 x 3.4 x 8.4	3.5 x 3.5 x 3.5	9.2 x 4.5 x 4.8	6.7 x 3.8 x 4.7	9 x 4 x 4.5
Info not available	4 watts	14 watts	5 watts	5 watts
N/A	5.6 x 8 x 9.6	N/A	9.5 x 6.3 x 4.7	N/A
N/A	10 watts	N/A	18 watts	N/A
None	SoundWorks Powered Sub- woofer (\$149.99)	None	J902 (\$159.95)	SW/1 (\$129.99)
None	None	None	None	None
Info not available	Info not available	50-20,000 Hz	35-5,000 Hz	40-20,000 Hz
Satellite	Remote pad	Satellite	Satellite, subwoofer	Satellite
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
1 year	1 year	N/A	N/A	Lifetime
■	■	2 years	2 years	■
8:30-8:00 M-F	8:00 A.M.-12:00 midnight, 7 days	11:30-8:30 M-F	11:30-8:30 M-F	10:00-6:00 M-F
None	None	None	None	None
None	info@hifi.com	None	None	None

bass ports in their enclosures, the Jazz speakers produce better bass than competing systems. The J-590 speakers have a power button and volume, bass, and treble controls; the J-902S has only a power button and volume control on one speaker and the same controls on the subwoofer. Adjusting the subwoofer's volume independently gives you more control, but it also means you have to play with both controls every time you want to change the volume.

The subwoofer gives the J-902S an edge at the very low end, but in listening tests we felt the high end sounded shallow. The J-590 had good bass for a two-piece system, and overall sound quality rivaled more expensive speakers, delivering clean, accurate sound reproduction and good presence.

The J-902S system is good, though not a standout in its price category. If you want to get more than you paid for, consider the J-590.—*Brian Fikes*

Jazz J-590. List price: \$149.95. **Jazz J-902S.** List price: \$199.95. *Jazz Inc., 1217 John Reed Court, Industry, CA 91745; 818-336-2689; fax, 818-336-2489.*

Circle 452 on reader service card

Koss Corp.

Koss HD/100, Koss SW/150

Koss has built a large business around delivering audio products to the price-conscious buyer. The Koss HD/100 two-piece multimedia system (\$99.99 list) sounded better than some others we heard but still showed weaknesses. The three-piece SW/150 system (\$179.99 list), the least expensive subwoofer-equipped system we reviewed, illustrates how much a subwoofer improves the sound of even inexpensive satellites.

Koss's experience in engineering for the mass market shows. The speakers were a snap to set up and include thoughtful touches such as clearly labeled jacks on the back, and headphone and microphone jacks up front. Both also feature inputs for two audio sources, with an input selector button conveniently located adjacent to the volume knob.

The HD/100 controls include separate bass-boost and treble-boost buttons, but we found that you will almost invariably want

them activated. Without the boosts, the sound was shallow and flat. Even with the boosts, music reproduction showed poor stereo imaging: The sound was discernibly emanating from two sound sources. And while the frequency range was adequate, more bass kick was needed. We also noticed that the right speaker was a little louder than the left, with no balance control.

The SW/150 system, made up of Koss's



The economical Koss SW/150s with subwoofer are easy on the ears and easy to set up.

HD/50 satellites (\$49.99 list) and SW/1 subwoofer (\$129.99), corrected most of these shortcomings. The subwoofer delivers plenty of bass and has its own volume knob so you'll want to position it fairly close at hand. Moreover, with the subwoofer there was much more presence to the sound, and plenty of volume for a small- or home-office environment. Again, though, we noticed the right speaker tended to dominate.

If you're replacing the speakers that came with your PC or multimedia kit, you'll want to trade up higher than the HD/100s. If you want the full, rich sound of a three-piece system but are still on a budget, the SW/150 speakers should satisfy you.—*JB*

Koss HD/100. List price: \$99.99. **Koss SW/150.** List price: \$179.99. *Koss Corp., 4129 N. Port Washington Ave., Milwaukee, WI 53212; 800-872-5677; fax, 414-964-8615.*

Circle 453 on reader service card

Labtec Enterprises Inc.

Labtec LCS-3210

With their Spatializer three-dimensional sound enhancement, the Labtec LCS-3210s (\$169.99 list, \$120 street) are being marketed toward the gaming community. Their sleek design will look good on your desktop, and the speak-

WHAT COULD YOU DO WITH THE LASER PRINTER FOR WINDOWS



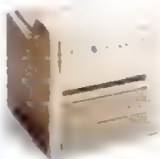
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 **TEXAS
INSTRUMENTS**

SUMMARY OF FEATURES

Multimedia Speaker Systems

PC MAGAZINE

EDITORS' CHOICE

PC MAGAZINE

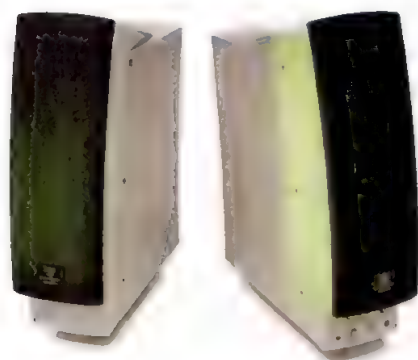
EDITORS' CHOICE

■ YES ■ NO

In alphabetical order by company

	Koss SW/150	Labtec LCS-3210	MIDI Land MLI-95	Multimedia Labs PC Amp- TC-1490-7SUB	NEC Audio- Tower Speaker System	NuReality Vivid 3D Speakers	RadioShack AMX-16
List price/Vendor's estimated street price	\$179.99, N/A	\$169.99, \$120	\$99.95, \$80	\$299.95, \$270	\$99.00, N/A	\$199.95, \$185	\$119.99, N/A
Speaker dimensions (HWD, in inches)	7.5 x 4 x 4	11.5 x 3.5 x 9	5.5 x 9.3 x 6	9.3 x 8 x 6	11.1 x 3.9 x 4.3	9.9 x 4.8 x 8.6	9.1 x 4.9 x 4.9
Output power (continuous, per channel)	5 watts	10 watts	15 watts	40 watts	4 watts	10 watts	5 watts
Subwoofer dimensions (HWD, in inches)	5 x 10 x 12	N/A	N/A	14.5 x 7.9 x 9.5	N/A	N/A	N/A
Output power (continuous)	20 watts	N/A	N/A	80 watts	N/A	N/A	N/A
Subwoofer model (and price) if sold separately	None	LCS-2410 (\$129.99)	MLI-S36 (\$239.95)	SP7006P Killer Sub (\$99.95)	None	None	Optimus Pro SW-10P 40-4070 (\$399.99)
Dimensional sound enhancement	None	Spatializer 3-D	None	None	None	SRS	None
Claimed frequency response (±3 dB)	150-20,000 Hz	48-20,000 Hz	20-20,000 Hz	20-22,000 Hz	150-18,000 Hz	Info not available	120-20,000 Hz
Volume control location	Satellite	Satellite	Satellite, subwoofer	Amplifier component	Satellite	Satellite	Satellite
Bass/treble controls	■ ■	■ ■	■ ■	■ ■ (equalizer)	■ ■	■ ■	■ ■
Balance/presence controls	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Headphone jack	■	■	■	■	■	■	■
Secondary input source	■	■	■	■	■	■	■
A/B input switch	■	N/A	■	■	■	■	■
Warranty (parts and labor)	Lifetime	1 year	Lifetime	1 year	1 year	1 year	90 days
Toll-free technical support	■	■	■	■	■	■	■
Technical-support hours (eastern time)	10:00-6:00 M-F	12:00-8:00 M-F	12:00-8:00 M-F	9:00-5:00 M-F	8:00-8:00 M-F	11:00-8:00 M-F	10:00-8:00 M-F, 10:00-6:00 Sat
Web address	None	http://www.labtec.com	None	None	http://www.nec.com	http://www.nureality.com	http://www.tandy.com
Internet address	None	marketing@labtec.com	None	medialabs@aol.com	None	sales@nureality.com	None

N/A—Not applicable. The product does not have this feature.



The Darth Vader-like Labtec LCS-3210s provide listeners the newest 3-D sound technology with their exclusive Spatializer feature.

ers deliver decent sound for the price. Setup of the LCS-3210s is simple; if you've ever hooked up a stereo speaker you need not even look at the directions. Labtec thoughtfully includes extra wiring.

During jury testing, the LCS-3210s fared well when playing rock tracks, evoking warm, rich sounds and providing a good definition of the musical instruments. Vocals were strong, clean, and crisp. The clas-

sical piece, however, sounded a bit flat.

Anyway, these speakers were designed for *Mortal Kombat*, not Mozart. With the Spatializer 3-D circuit enabled, game sound-effects do indeed take on a more realistic feel. Rockets approach and whiz past, disappearing behind you.

The effect adds more dimension to music as well, though some listeners may find the spaciousness too artificial. But if defending the universe consumes your lunch break, the LCS-3210s's Spatializer feature will prove delightful.—*Holly Aguirre*

Labtec LCS-3210. List price: \$169.99. Labtec Enterprises Inc., 3801 Northeast 109th Ave. Vancouver, WA 98682; 360-896-2000.

Circle 454 on reader service card

MIDI Land Inc.

MIDI Land MLI-95

If you want lots of sound for a little money, listen to the MLI-95 (\$99.95 list, \$80 street) from MIDI Land. These speakers will be more than adequate for

gamers, and for those who primarily listen to music but who can't justify spending a lot on a computer sound system.

The MLI-95s have a squat, love-it-or-hate-it design. They feature inputs for two audio sources, though on our test pair the left speaker's input jack came loose and fell back inside the case. We had to open the case and tape it back in place.

In listening tests, the MLI-95 pair sounded quite good for speakers in this price range. The sound was full and clean, and held together nicely even at high volumes. On the downside, we did find ourselves



The MIDI Land MLI-95s: solid on sound for their price.

Ends

Recoton WC430	Roland MA-12CP	Sony SRS-PC50	Sony SRS-PC300D	Yamaha YST-M10	Yamaha YST-SS510
\$249.99, \$200	\$259.00, \$199	\$129.95, \$100	\$249.95, \$200	\$149.00, \$99	\$299.95, \$199
8 x 5.3 x 5	8.6 x 5.2 x 6.5	7.1 x 3 x 5.7	3.7 x 4 x 3.3	8.8 x 3.8 x 6.4	8.3 x 3.2 x 4.9
5 watts	10 watts	3 watts	5 watts	10 watts	3 watts
N/A	N/A	N/A	10.7 x 5.1 x 8.7	N/A	7.9 x 11 x 10.2
N/A	N/A	N/A	15 watts	N/A	25 watts
None	None	None	None	YST-MSW10 (\$199.95)	YST-MSW10 (\$199.95)
None	None	None	None	None	None
50–15,000 Hz	Info not available	Info not available	60–20,000 Hz	35–20,000 Hz	35–20,000 Hz
Satellite	Satellite	Satellite	Satellite, subwoofer	Satellite	Satellite, subwoofer
■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
■	■	■	■	■	■
■	■	■	■	■	■
■	■	■	■	N/A	■
Lifetime	One year parts, 90 days labor	One year parts, 90 days labor	One year parts, 90 days labor	One year	One year
■	■	■	■	■	■
7:00 A.M.– 1:00 A.M. M–F	11:30–8:00 M–F	N/A	N/A	11:30–8:00 M–F	11:30–8:00 M–F
None	None	http://www.sony.com	http://www.sony.com	http://www.yamaha.com	http://www.yamaha.com
None	None	None	None	None	None

turning up the bass control to max (and still wanting more), and the speakers were very directional; your ears will pinpoint the speakers as the sources of the sound rather than some point between them as it should be. Casual multimedia users will be happy with the MLI-95s on their desks, and the cash they saved in their pockets.—JB

Midi Land MLI-95. List price: \$99.95. *MIDI Land Inc., 440 S. Lone Hill Ave., San Dimas, CA 91773; 909-592-1168; fax, 909-592-6159.*

Circle 455 on reader service card

Multimedia Labs Inc.

PC Amp-TC-1490-7SUB



If you really want to get good sound out of your PC, you should connect it to a home stereo system. Since that's not a luxury everyone can afford, Multimedia Labs decided to create a mini home stereo for computers. The \$299.95 (\$270 street) PC Amp-TC-1490-7SUB speaker system in-

cludes a pair of large satellite speakers, a floor-standing subwoofer, and a separate power amplifier with a built-in equalizer.

Although it means another component on your desktop, you can slip the slimline amplifier under your monitor. For your trouble, you get lots of added multimedia-oriented niceties, such as a five-band active equalizer, a variable subwoofer slide control, and a built-in microphone. The PC Amp also has gold-plated jacks for an external microphone, a 1/4-inch headphone jack, two pairs of stereo inputs, and a stereo line out. Setting up the PC Amp is a little more complex than just plugging a cable into a sound card. The payoff is plenty of power to deliver sufficient volume levels. And with the built-in equalizer, the system can be adjusted to suit a variety of sound sources and listening spaces.

In subjective tests, we found the system to be surprisingly sharp on high-end treble notes. The PC Amp speakers also proved supple enough to handle quiet Beethoven piano sonatas yet powerful enough to kick out metal tracks.



Multimedia Labs' high-powered PC Amp-TC-1490-7SUB sound extravaganza was among the best we heard.

If you don't have a top-notch sound board, or if you're cramped into a tiny working space, the PC Amp-TC-1490-7SUB system is overkill. But for no-compromise computer-based audio, Multimedia Labs' entry is a bargain.—JQ

PC Amp-TC-1490-7SUB. List price: \$299.95 Multimedia Labs Inc., 458 Main St., Reisterstown, MD 21136; 410-429-4300; fax, 410-429-2919.

Circle 456 on reader service card

NEC Technologies Inc.

NEC AudioTower Speaker System

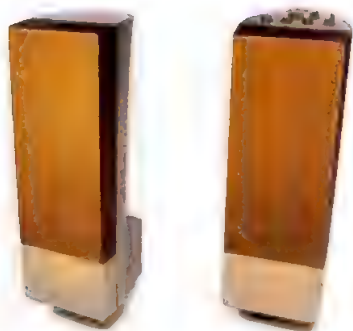


The NEC AudioTower Speaker System (\$99 list) was our favorite sub-\$100 system. The swept-back tower design will look good next to your monitor (and especially complements NEC monitors—no accident), and the speakers provide enough sound for small-office or home-office environments. The sound reproduction is not perfect, but these units deliver the best sound quality we heard in this price category.

The fine case design carries over into good ergonomics as well. The top-mounted volume knob is large and easy to grasp, and the row of smaller knobs lets you individually adjust the bass, treble, and balance levels. The back panel has inputs for a 1/4-inch mini-plug and RCA jacks, plus a headphone output.

The AudioTowers showed good stereo imaging. Sound quality was a little flat in comparison to some of the more expensive speakers our jury listened to, but listeners

Multimedia Speakers



The NEC AudioTower Speaker System won points for sound, design, and price.

were impressed when we told them the price. Highs tended to be a bit tinny, though with the bass and treble controls we were able to sculpt a sonic presence that was more than adequate for multimedia presentations and personal listening. The units started clipping noticeably at two-thirds volume, so they aren't adequate to fill a conference room with sound. If you want good-quality, good-looking computer speakers but think it's outrageous to pay over a hundred dollars for speakers, the NEC AudioTower is your best bet.—JB

NEC AudioTower Speaker System. *List price: \$99. NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; 800-632-4636, 508-264-8000.*

Circle 457 on Reader Service Card

NuReality

Vivid 3D Speakers

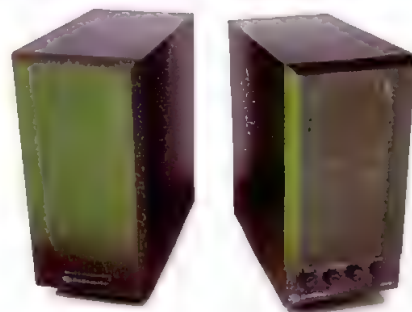
If you want to add dimensionality to your multimedia listening experience, try NuReality's Vivid 3D Speakers (\$199.95 list, \$185 street). NuReality has licensed SRS's three-dimensional sound technology, so a gamer using any sound card can hear bullets ricocheting, rockets approaching, and race cars zooming by them. The SRS circuit also adds dimensionality to music played through your PC or other audio source.

Unlike other speakers in this roundup that employ dimension-enhancing switches, the Vivid 3D set is completely adjustable. A "space" knob adjusts the width of the audio image, while the complementary "center" knob brings the primary source of the audio recording, usu-

ally the vocalist, into the foreground. The input source switch can be set to mono (which creates stereo sound from a mono audio source), bypass (for conventional stereo sound), or stereo (which enables the SRS processing).

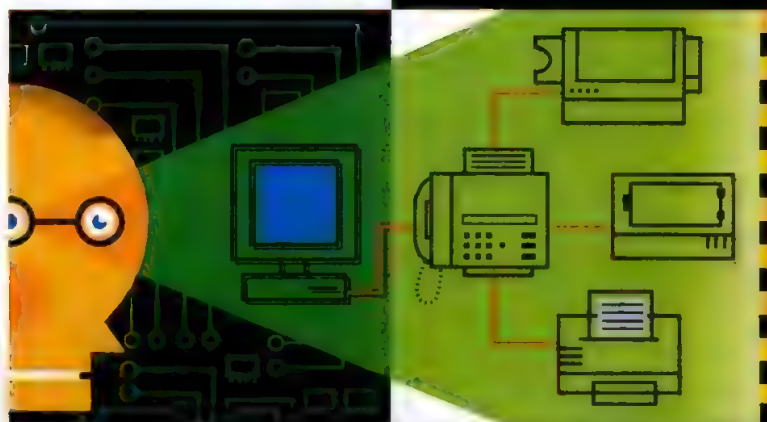
The ported wooden cabinets provide plenty of bass response, even without a subwoofer. In jury tests, the Vivid 3Ds produced a full sound with a wide sound stage that gave listeners the sense that they were immersed in the music.

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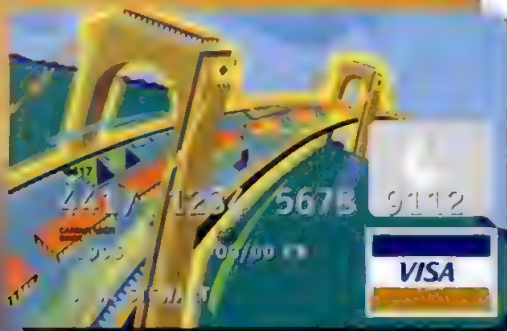


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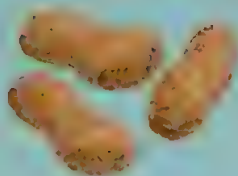
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CIRCLE 278 ON READER SERVICE CARD

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Multimedia Speakers

sounds over-processed, you can turn down the space control or even set the input source to "bypass." And if you're an avid gamer, you owe it to yourself to give the Vivid 3Ds a listen.—*Denis Tom*

Vivid 3D Speakers. List price: \$199.95. NuReality, 2907 Daimler St., Santa Ana, CA 92705; 800-501-8086, 714-442-1080. Circle 458 on reader service card

RadioShack

RadioShack AMX-16

The RadioShack AMX-16 speakers are not the best-sounding speakers in this roundup. In fact, we were disappointed with this set (\$119.99 list) and felt other speakers in this price range would be a better choice.

Their design is basic, simple, and boring. The operating instructions consist of three mundane how-tos: how to turn on the power, turn up the volume, and control the balance. Enough said. Here in New York City you can hardly throw a rock without hitting a neighborhood RadioShack, which was convenient when we had to go out and buy the set of RCA cables that aren't included with the AMX-16s.

In listening tests, our jury felt the speakers lacked a good stereo image; your ears could tell the music was coming from the two boxes situated next to your monitor. There is also a distinct lack of depth and overall sound quality. While playing a rock music track, highs cracked, the bass bled, and the speakers themselves hummed. Since there are no controls for bass or treble, you're stuck with whatever happens to be coming out of the sound card at the time. There is a jack for headphones, and according to the instructions, your local RadioShack store has a wide selection.



The RadioShack AMX-16s: They're inexpensive. They're sturdy. The store is convenient.

For the computer enthusiast on a budget, buying RadioShack components for all-purpose use or gaming is always an option. For the fidelity freak, there are several better options that are similarly priced.—*HA*

RadioShack AMX-16. List price: \$119.99. RadioShack, 1500 One Tandy Center, Fort Worth, TX 76102; 800-843-7422.

Circle 456 on reader service card

Recoton Corp.

Recoton WC430

The most notable thing about the Recoton WC430 speakers (\$249.99 list, \$200 street) is that they are wireless. The transmitter, which you connect to your sound card, sends the signal to the two satellite speakers, which you can place anywhere in the room or even in another

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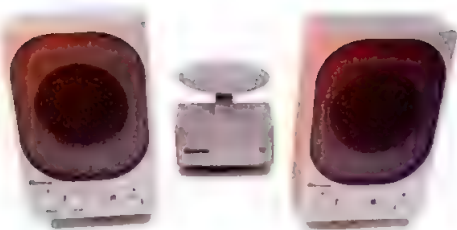
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CIRCLE 306 ON READER SERVICE CARD

Multimedia Speakers



The wireless Recoton WC430s left us wanting.

room (up to 50 feet away). Unfortunately, the poor sound reveals you're paying for the wireless novelty, not the quality of the speakers.

When you set up the Recotons, you must tune them to the frequency of the transmitter. You can vary this frequency, so after a few trials you should be able to get a fairly clean signal. We found it necessary to move the transmitter repeatedly before we could get a decent signal, and even then there was considerable pink noise. Each speaker has its own volume control, but you'll probably opt to use your mixer applet since the speakers may be out of reach. You'll also want to run the speakers with battery power to make them truly wireless, though Recoton does include AC adapters.

Alas, the overall quality of the sound was lacking. Music came out lifeless and flat, the background hum was annoying, and the battery chamber rattled.

If you don't need the wireless feature, then you can get better-sounding speakers for less money.—BF

Recoton WC430. List price: \$249.99. Recoton Corp., 2950 Lake Emma Rd., Lake Mary, FL 32746; 407-333-8900.

Circle 460 on reader service card

Roland Corp. U.S.

Roland MA-12CP

In this corner are the Roland MA-12CPs (\$259 list, \$199 street). These speakers weigh substantially more than other multimedia speakers of the same size. They are constructed solidly, from the metal cases to the 1/4-inch phono inputs to the heavy-duty power cords.

Each speaker has its own internal amplifier, power cord, inputs, and volume, treble, and bass controls. This means it takes a little more work to adjust the settings, but you can also use your sound card's mixer control or volume settings. Each speaker has three 1/4-inch phono in-

puts, two at line level and one at mic level. You can't switch between the inputs; all three are added together. Because most sound cards have RCA or 1/8-inch phono plugs, and since audio cables are not included with the speakers, you will need to use adapters.

The sound is very clean, with one of the lowest noise measurements of this roundup. The frequency response was not as good as many of the other speakers we listened to, but the clean, defined sound more than made up for this. We were able to get much more volume from these speakers than most, and could turn the volume close to maximum without noticeable distortion.

These speakers will work very well for



The only drawback about the crisp and clear Roland MA12-CPs was their price tag.

music, game playing, or MIDI work, especially if you ever get the urge to crank the volume.—BF

Roland MA12-CP. List price: \$259. Roland Corp. U.S., 7200 Dominion Circle, Los Angeles, CA 90040-3696; 213-685-5141.

Circle 461 on reader service card

Sony Electronics Inc.

Sony SRS-PC50, Sony SRS-PC300D

Ergonomics and inputs: These are the two features that grab you when first see the Sony SRS-PC50 (\$129.95 list, \$100 street) and SRS-PC300D (\$249.95 list, \$200 street). Despite their names, these speakers do not utilize SRS's sound-enhancement technology. And despite the Sony name, we thought competing speakers in the two price classes delivered better sound.

The SRS-PC50 pair of 3-inch-wide speakers mount easily on the sides of your monitor. The thoughtful ergonomic design gives you access to the power button, vol-



The Sony SRS-PC300D with subwoofer provides acceptable sound, but others proved better.

ume and bass thumbwheel controls, a stereo mini-jack for an extra input source, and headphone jacks, all on the front of the left speaker.

In listening tests, we found the sound quality of the SRS-PC50 speakers below average. Music sounded dull and hollow, and low-end response was sorely lacking.

The three-piece SRS-PC300D adds a subwoofer to diminutive satellite cube speakers. You can switch to either input source or mix both sources at the same time. All of the controls of the SRS-PC300D (including the power button) are located on the subwoofer, so you'll want to keep it close by to adjust these controls.

The sound quality of the SRS-PC300D system was better. Instruments were crisp and sharp. There was plenty of bass and the highs were clean, but we sensed a void in the midrange frequencies, as if neither the subwoofer nor the satellites were filling that space.—DT

Sony SRS-PC50. List price: \$129.95. **Sony SRS-PC300D.** List price: \$249.95. Sony Electronics Inc., One Sony Dr., Park Ridge, NJ 07656; 1-800-222-7669.

Circle 462 on reader service card

Yamaha Corp. of America

Yamaha YST-M10 Yamaha YST-SS510

Having an attitude isn't always a bad thing. These two speaker systems from Yamaha, for example, convey a mellow rather than hard-edged demeanor. Both the \$149 Yamaha YST-M10 (\$99 street) and the \$299.95 YST-SS510 (\$199 street) tend to take a warmer, gentler approach to sound reproduction. While this attitude will attract some listeners, others will feel that there are more

Multimedia Speakers

precise multimedia speakers to be had.

The YST-SS510 is a three-piece package based on Yamaha's YST-MSW10 subwoofer. The YST-MSW10 can accept stereo-line inputs from a sound board, as well as speaker-level inputs from a conventional stereo system. Yamaha had the foresight to install an auto-power off-feature into the subwoofer that turns it off after 10 minutes of silence.

Attached to the subwoofer as part of the YST-SS510 package are Yamaha's YST-M5 satellite speakers. Available separately for \$99.95 (\$40 street), the YST-M5 speakers have their own power, presence, and volume controls up front. The YST-SS510 system yields fine bass and overall frequency response. But, they were unable to reproduce some instruments clearly and lacked a certain degree of acoustical depth.

The two-piece YST-M10 system offers respectable sound for the price. Its simple design, with power, presence, and volume controls, makes it a convenient multimedia upgrade. The only qualms we had with the YST-M10 were a perceived roll-off on high notes and a slight lack of sonic clarity.

Either Yamaha speaker solution would boost the audio capabilities of most PCs. While the YST-SS510 package doesn't quite match the sonic accuracy of comparably priced systems, bargain hunters will find a real value in the YST-M10 speakers. Want more? In the sidebar "Spending More: What Price Fidelity?" we discuss another option: the company's \$349.95 YST-SS1010 bundle (\$249 street).—JQ □

Yamaha YST-M10. List price: \$149. **Yamaha YST-SS510.** List price: \$299.95. Yamaha Corp. of America, 6600 Orangethorpe Ave., Buena Park, CA 90620; 800-823-6414, ext. 99; 714-522-9011; fax, 714-228-3913.

Circle 463 on reader service card



Say hello to the sleek and sexy Yamaha YST-SS510s, an all-around good speaker system.

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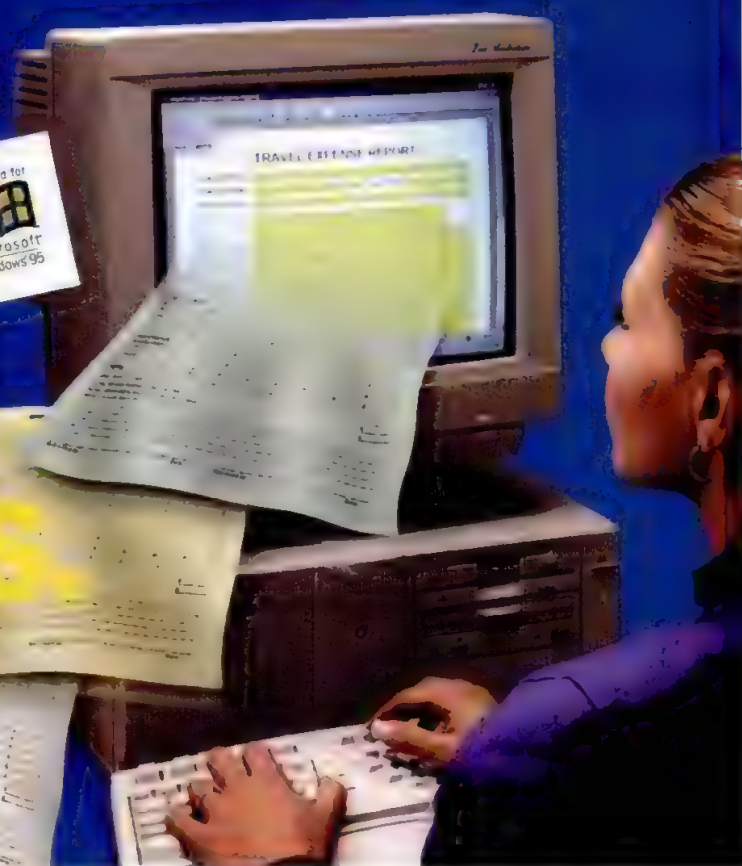


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CIRCLE 245 ON READER SERVICE CARD

NETWORKED CD-ROMs

Serving from a Silver Platter



There are almost as many ways to share CD-ROMs on a network as there are products for doing so. But which way is best for your network configuration?

By Steve Rigney

Providing storage capacity of 650MB and easy portability, CD-ROM has become the most popular medium for distributing PC-based software applications, operating systems, and reference databases—not to mention multimedia games and educational titles.

As CD-ROM products multiply, network administrators are looking for ways to give their users access to these resources. In this roundup we look at 20 products that provide shared access to CD-ROM data on a NetWare LAN. Some of the products are software packages that you can use to share your own CD-ROM

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hardware; others are hardware/software bundles that give you both the drives and the sharing software. Since the actual technology for sharing CDs resides in the software, we specified that participating vendors must be the original software manufacturers. We also specified that each solution must provide concurrent shared access on the LAN to the data from four CD-ROM disks.

THE LIMITATIONS OF THE NOS

Most major peer-to-peer and server-centric NOSs provide capabilities for sharing CDs on the LAN (see the sidebar "Sharing CDs with Your NOS"). They come with basic tools for mounting and dismounting CDs and assigning access rights to the drives.

If your needs are more than basic, however, you'll probably want the added configuration and management tools that the packages reviewed here provide. Many help you keep better track of the CDs being shared and simplify client ac-

cess. And if you're sharing CDs on a NetWare LAN, you'll probably prefer these packages to NetWare's cumbersome CDROM.NLM, which can make mounting CDs a time-consuming process. As you add drives to the server, NetWare's method of sharing CDs also uses up lots of precious server memory. Most of the products reviewed here have quicker mounting times than NetWare. The NLM-based products still require lots of memory, however.

STEP ONE: THE HARDWARE

One of your first decisions will be what type of hardware to use. If you have a small budget and need to share only a handful of CDs among a small workgroup, you can probably get away with installing a few drives on a client PC or file server.

If you're serving a larger user base with a small library of CDs, the next step up is a tower enclosure that houses four to seven drives. The obvious advantage of multiple drives is that you spend less time

swapping disks. And a tower enclosure is easier to manage than a daisy chain of external drives cabled to a single SCSI adapter. A CD-ROM tower connects to a PC via a SCSI adapter. A CD-ROM server contains its own processor, memory, hard disk, network interface, and CD-ROM drives and can sit anywhere on the LAN. Which solution you choose is very much a reflection of the software solution you choose and your management needs.

You can string together several towers or servers, providing fast access to tens or even hundreds of CDs. However, if you have an extensive library of CD-ROMs to share, at some point it becomes more economical to go with a CD jukebox. Such units consist of one or more drives plus storage for anywhere from 6 to 500 or more CDs. Like the diner jukeboxes of yore, they have robotlike devices that automatically load CDs into the drives when they're requested. Access to CDs in a jukebox can be much slower than accessing drives in a tower, however, since the number of drives doesn't match the number of available CDs. Jukeboxes are not good solutions for titles that must be online at all times.

With one exception, all nine hardware/software bundles we received were tower configurations. Of the eight towers we tested, only three—the Logicraft XF-4500, Microtest's DiscPort Tower, and SciNet's CD-System—were standalone

NETWORKED CD-ROMs

How to Read the Suitability to Task Boxes

Since in all cases CD-ROM sharing was implemented in software, we based our Suitability to Task ratings on the software products we tested. Accordingly, we look at four common tasks for implementing and using CD-sharing services on the network.

For **setup and installation** we evaluate the ease with which the software integrates into an Ethernet LAN with NetWare servers and DOS, Windows, and Windows 95 clients. We consider the advantages and disadvantages of the type of solution—peer-to-peer, file-server extensions, or dedicated CD-ROM servers—and any problems or conflicts we encountered while installing it on the network. We also determine what installation procedures are required to connect users to the shared CDs.

SUITABILITY TO TASK	
Product Name	
Setup and installation	Poor
Administration and management	Fair
Scalability	Good
Client access	Excellent

We address **administration and management** by investigating the amount of control the system permits over user environments, the usefulness of the drive-mapping utilities, and whether a single drive letter is required for each CD-ROM. We take into account how flexible the management options are and especially whether management must be performed at the server or can be done remotely from anywhere on the network. We also examine security,

utilities for connecting and disconnecting clients, and fault-tolerance features.

For **scalability** we consider the maximum number of drives that can be added to the system, the amount of overhead generated by adding CD-ROM drives, and what kind of licensing the product requires.

When adding a service to the network, **client access** is always of concern to the network administrator. How much the product affects client systems is judged in terms of the product's driver implementation and method of CD access. If client software is required, we evaluate what value it adds. We also look at whether the system works with local CD-ROM drives and MSCDEX.

devices that could sit anywhere on the LAN. JVC's CT-800 CD Tower can also sit anywhere on the LAN, but it must be attached to a PC. We also consider Plexor's PlexServer, which is a standalone CD-ROM server, in a sidebar. The exception to the tower rule was the Editors' Choice Microtest DiscPort Pro, a nifty print-server-like device that can also sit anywhere on the LAN. It comes with SCSI connectors for connecting your own CD-ROM hardware.

THE MAGIC IS IN THE SOFTWARE

Choosing a hardware configuration is the easy part, however. In most cases the CD-ROM sharing and management functionality is in software. And in fact, the Suitability to Task ratings in the reviews that follow are based on the software.

All of the hardware configurations we tested are bundled with CD-sharing software. And all of the vendors except Microtest also let you purchase the software separately and use it with whatever hardware you choose. Four other vendors—Corel, Micro Design International, Ornetix Network Products, and Stac Electronics—sent us software-only solutions.

There's more than one way to do just about anything, and that holds true for CD-sharing software solutions. We found five different methods for sharing CDs (see "Five Ways to Share CDs"), each with its own advantages and disadvantages.

CD-ROM STANDALONE SERVERS

Two of the five methods for sharing CDs—peer-to-peer and dedicated CD-ROM servers—allow you to place a CD server with its own processor, network adapter, and CD-ROM drives anywhere on the LAN. In the case of a peer-to-peer setup, the CD sharing occurs independently of the NOS. Software loaded on each individual workstation interprets requests and communicates with networking software on the CD-ROM server, which is usually a standalone device but can also be any PC on the LAN. Of the

Microtest DiscPort Pro

CD-ROM solutions come in all shapes and sizes, but the DiscPort Pro fits almost anyone's needs.

The DiscPort Pro is our Editors' Choice for its multitude of options that bring together the best features

of the solutions we reviewed: It uses a NetWare NLM for easy installation, good performance, and transparent client access, and it offers the flexibility of server-independent CD-ROM drives.

Since it doesn't need to be attached to a file server, the DiscPort CD server can be placed anywhere on the network and installed easily without shutting the file server down. This means you can put the physical drives wherever they are most convenient—after all, the network manager doesn't necessarily manage the shared CDs. And the DiscPort Pro's unique miniserver design lets you attach up to 14 SCSI CD-ROM drives of your own choosing.

Network users access the CDs as they would any other shared NetWare drive, so the DiscPort Pro does not need additional proprietary client software. The DiscPort Pro does include an optional Windows client utility, SmartLaunch, that can automatically map drives, launch applications, and then delete the mapped drives.

DiscView Pro, Microtest's management software, was among the best in this roundup. Managing CDs with DiscView is as easy as installing it. A graphical view shows you servers,

DiscPort hosts, and individual CD drives all at once to let you manage multiple DiscPorts simultaneously. Ejecting a disk from a drive is as easy as clicking on its icon.

Although it also comes with DiscView Pro, Microtest's DiscPort Tower did not receive an Editors' Choice because of its significantly poorer performance on our benchmark tests.

An honorable mention goes to Meridian Data's CD Net Plus 6.0, with its excellent client software, support for up to 56 drives per server, and good management and security features. It can be installed either on a DOS machine in a peer-to-peer setup on an IPX network or on a NetWare server as an NLM (although the security features of CD Net Plus are disabled in the NLM version).

Among CD Net's desirable features are load balancing, software-license metering, and server-independent mapping, which maintains clients' access to CDs regardless of which drive or server they're on. You can even assign group access rights to logical groups of CD-ROMs. Meridian's full-featured Windows client software lets you choose volumes to appear as separate drive letters or as subdirectories under a single drive letter on the fly.

comes with CD Net Plus 6.0, can be configured for a peer-to-peer setup or as a file server extension.

While no network manager likes to load memory-resident programs on every client PC, the peer-to-peer configurations we examined do offer useful Windows-based CD-ROM management utilities for configuring drive access. CD Library Manager server software even includes extensive reporting capabilities for analyzing server and usage statistics. Client-



hardware/software bundles we tested, JVC's CT-800 CD Tower with CD Library Manager and Logcraft's XF4500 with LanCD 3.1 use this implementation. Meridian Data's CD NET ROM, which

Our Contributors: STEVE RIGNEY and TONY POMPILI are contributing editors of *PC Magazine*. ARUN R. DESAI and CHARLES LIN are freelance writers. TED NEEDLEMAN is a frequent contributor to *PC Magazine*. ANATOLIY NOSOVITSKIY is an associate project leader, GREGORY SEWELL is a researcher, and TODD SPANGLER is a staff editor at *PC Magazine*. LEON ERLANGER was the senior associate editor in charge of this story, and JEFFREY G. WITT was the project leader.

Networked CD-ROMs

access utilities among the peer-to-peer products were also good. Logcraft's LanCD lets you set up batch files that mount a CD, run the application, then dismount the CD when the application is closed. It also lets clients load all accessible CD volumes under a single drive mapping. Both utilities are somewhat difficult to use, however. Meridian Data's solutions feature capabilities similar to those

of LanCD but are easier to use and add *server-independent mapping*, which can map a disk to a client no matter what server it's on. With server-independent mapping, you don't have to worry about putting a particular disk in the same drive every time you swap disks.

Peer-to-peer implementations are decent solutions for sharing CDs among small-to-medium workgroups. The more

users you have, however, the bigger a chore it becomes to load a software program or TSR on every client's PC. TSRs can also consume precious client memory, and peer-to-peer solutions run a proprietary transport across your already busy network cable.

Dedicated CD-ROM servers, represented here by products from Ornetix and SciNet, contain software that actually em-

Five Ways to Share CDs

The products we tested use many different methods for sharing CDs. Each has its advantages and disadvantages.

	Peer-to-peer	File-server extension	Dedicated CD-ROM server	Standalone miniserver	Hard disk solution
Method	TSR or Windows software on the client redirects requests to a PC on the LAN with CD-ROM drives and CD-ROM server software. The CD server passes information back to the client.	Client requests are sent to the NLM on the file server, which redirects them to the CD-ROM server. The CD-ROM server returns the data to the NLM, which sends it to the client.	Emulates a NetWare file server. Client requests are sent to a dedicated CD-ROM server, which returns the data to the client.	Sits independently on the LAN. Client requests are sent to the NLM on the file server, which sends them to the miniserver. The miniserver returns the data to the NLM, which sends it to the client.	CDs are copied to the server's hard disk and compressed. Client requests are sent to the file server. The file server reads the data off the hard disk and sends it to the user.
Hardware requirements	Standalone networked PC with CD-ROM drives, or a CD-ROM tower.	CD-ROM drives attached to the file server via a SCSI adapter. CD-ROM towers are available.	Standalone networked PC with CD-ROM drives.	Networked CD-ROM tower, or server box with a processor and some RAM.	CD-ROM drive and lots of hard disk space on the server.
Pros	Can sit anywhere on the LAN. NOS-independent and low-cost. Installation does not require bringing down the file server.	Fast. Does not require an additional PC or client software installation. Easy, centralized management.	Can sit anywhere on the LAN. Easy management. Installation does not require bringing down the file server. Off-loads CD-ROM traffic from the file server. Allows a large number of shared drives.	Can sit anywhere on the LAN. Highly scalable. Easy management. Installation does not require bringing down the file server.	Very inexpensive if you have the hard disk space. NOS-independent. Potentially very fast performance. Easy installation and management.
Cons	User must install software on every PC. Client software (especially if TSR) consumes client memory. Can be difficult to manage.	Must sit near a file server. Adds processing, memory, and hard disk load to the file server. NLMs can cause file-server instability. Installation requires file-server downtime.	Can be expensive.	NLMs can cause file-server instability. Adds processing, memory, and hard disk load to a file server.	Copying CD-ROMs to the hard disk can take a lot of time. The number of sharable CDs is limited by hard disk space.
Recommended network size	Small to medium-size workgroups.	Small to medium-size workgroups.	Larger networks.	Any size networks.	Any size networks sharing a limited number of CD-ROMs.
Software products in this roundup	CD Library Manager, CD Net Plus*, LanCD.	CD-Access One-on-One, CD Net Plus*, CorelSCSI, SCSI Express for NetWare, SCSI Shuttle, SCSI Shuttle Lite.	CD-Commander, CD-Manager, CD-Vision.	Microtest DiscView Pro (bundled with DiscPort Pro and DiscPort tower).	CD-Quickshare.
Hardware/software bundles in this roundup	JVC CT-800 CD Tower, Logcraft XF 4500, Meridian CD NET ROM*, Meridian CD Net 314/Q.	Around DataHouse Nuvo Estate S170, Meridian CD NET ROM*, TAC HotSwap MiniTower.	SciNet CD-System.	Microtest DiscPort Pro, Microtest DiscPort Tower.	Logcraft XF4500 with FastCD option.

* This product lets you choose between a peer-to-peer and a file-server extension configuration.

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Fountain fills	YES	NO
Center and repeating arrows	YES	NO
Hyperlinks	YES	NO
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Script editor	YES	NO
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Plextor's PlexServer

By Charles Lin

Plextor is the only leading manufacturer of CD-ROM drives that offers its own complete package for sharing CDs on the LAN. Called the PlexServer, it lists for \$8,399 and consists of a plug-and-play CD-ROM tower server, with Ornetix's CD-Vision and CD-Commander software (reviewed elsewhere in this feature) preinstalled. Since the software is not manufactured by Plextor, the PlexServer did not make it into the main roundup. CD-Vision emulates a NetWare 3.x server and includes such features as automatic load balancing and virtual volumes; the latter lets you group several CD drives under one volume.

The PlexServer was very easy to install and is almost as easy to maintain. Its modular design makes it easy to service: To open the case, you don't even need a screwdriver. Our test unit, powered by an Intel 486DX2/66 processor, came with seven sextuple-speed Plextor drives (a version with seven quad-speed drives



The modular PlexServer (\$8,399) includes Ornetix's CD-Vision and CD-Commander software plus seven 6X CD drives.

costs \$7,399). Hot-swappable CD-ROM drives aided by redundant, hot-swappable power supplies ensure that your PlexServer will almost never go down.

Each SCSI drive easily attaches to and detaches from the backplane on the cabinet. The SCSI ID is preset on the backplane so that when you replace drives, you don't need to con-

figure them. Removing two thumb-screws lets you slide out the CPU module to be exchanged.

The PlexServer can be attached to your network via a UTP or STP Ethernet connector. Four separate SCSI buses let you add up to 28 additional external CD-ROM drives.

Using your own PC, you can build your own CD-ROM server with the Plextor Hot-Swap Tower Kit (\$5,449), which also includes seven sextuple-speed drives, a bus-mastering SCSI controller, and a ten-user license for Ornetix's CD-Vision software.

With its easy installation, modular design, and hot-swappable hardware, the PlexServer could make a Plextor technician very lonely.

PlexServer. List price: \$8,399. **Plextor Hot-Swap Tower Kit.** List price: \$5,799. Plextor, 4255 Burton Dr., Santa Clara, CA 95054; 800-886-3935, 408-980-1838; fax, 408-986-1010; Web, <http://www.plextor.com>.

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ulates a NetWare file server, making CD-ROM drives appear to everyone as NetWare volumes. With dedicated CD-ROM servers there is no need to load NLMs on the file server, nor do you have to load any client software. Because these servers emulate a NetWare file server, you can use standard NetWare utilities such as Fconsole to manage your CDs. Ornetix and SciNet also include separate management tools that add to those offered by NetWare. SciNet's DOS-based tools are rudimentary, but Ornetix's Windows-based CD-Commander lets you see which titles are in which drives and also meter CD-ROM applications. It also provides clients with a floating toolbar that contains icons for networked drives. Dedicated CD-ROM servers are excellent solutions for larger networks.

The greatest advantage of the dedicated CD-ROM hardware/software bundles from Plextor and SciNet was their ease of installation. After we unpacked each box, we simply connected the cables and hit the power switch, and we were up and running.

NETWARE FILE-SERVER EXTENSIONS

NetWare file-extension solutions add CD-ROM drives and NLMs to an existing NetWare file server. With the exception of Microtest's products, the products we tested use this method for sharing CD-ROMs. Unlike peer-to-peer solutions and dedicated CD-ROM servers, file-server extension products rely on the processor and memory in your file server to make the CDs available to your end users. Towers from Around Technology and TAC connect directly to the file server via a SCSI adapter. Meridian Data's CD NET ROM attaches to the file server, too, but it can also be used in a peer-to-peer setup connected to a separate PC on the LAN.

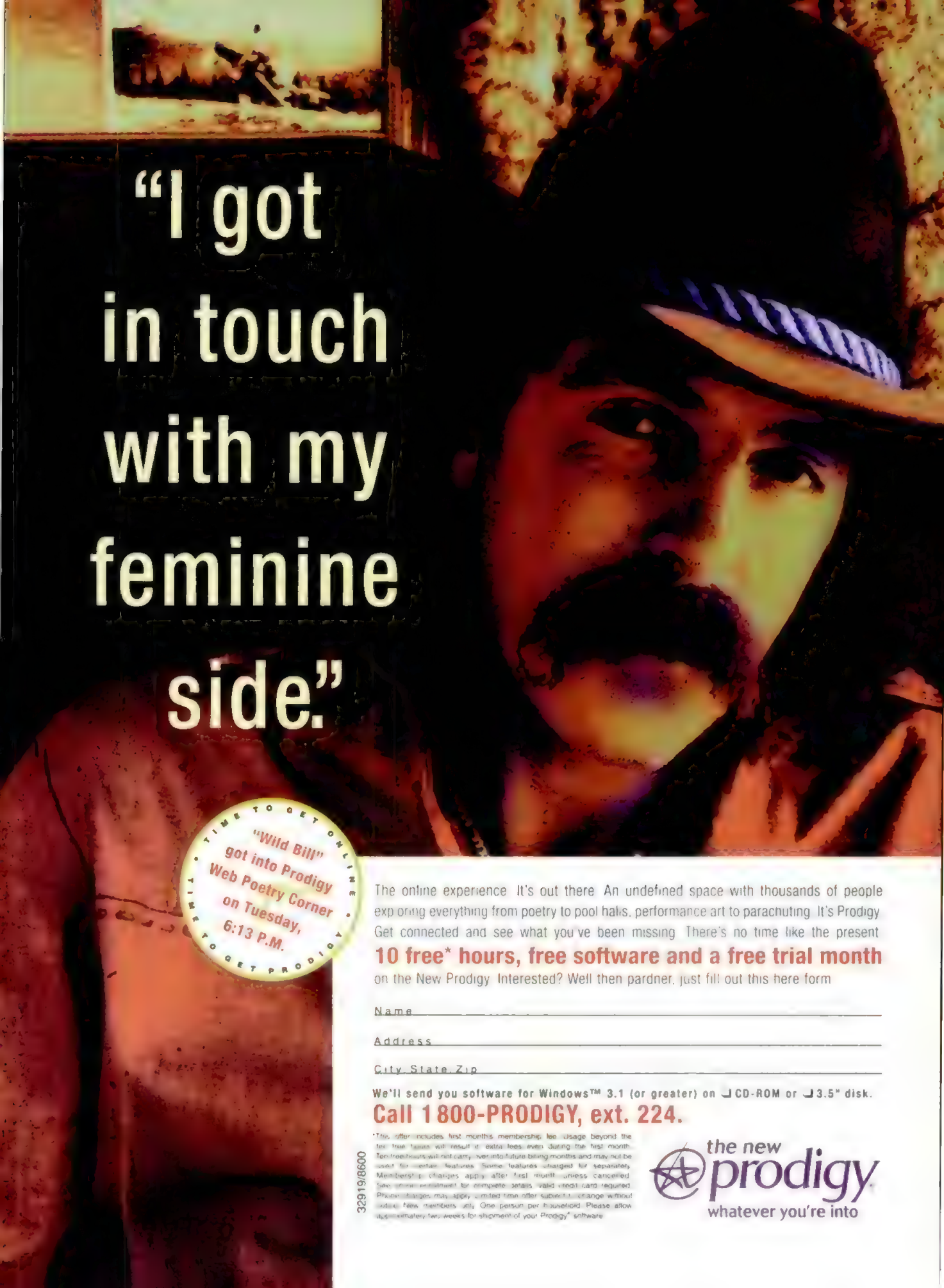
File-server extension products tended to be the best performers on our benchmark tests. What you gain in performance, however, you give up in freedom, since these products have to be placed near the file server. As with any NLM, you have to add memory and a SCSI adapter to the server and hope there are no conflicts with other third-party NLMs.

As you add more CD-ROM drives using an NLM, you may end up having to dedicate a server to CD-ROM access.

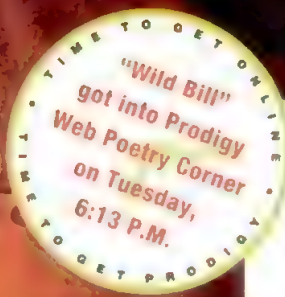
We liked the ability to use our existing NetWare client drivers to access the CDs on the network, but management tools among the file-server extension products tended to be basic, relying to a large extent on NetWare's built-in utilities. CorelSCSI, SCSI Express, and SCSI Shuttle for NetWare all let you gang up multiple drives under a single NetWare volume, however.

STANDALONE MINISERVERS

Miniservers are represented here solely by Microtest's DiscPort Tower and DiscPort Pro (our Editors' Choice). Like file-server extensions, they use NLMs on the file server but are standalone devices that can sit anywhere on the LAN. Unlike the other NLM products, Microtest's DiscView Pro came with excellent management utilities that provide graphical views of your LAN and let you manage multiple DiscPorts simultaneously.



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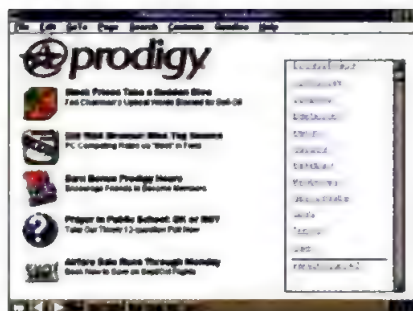
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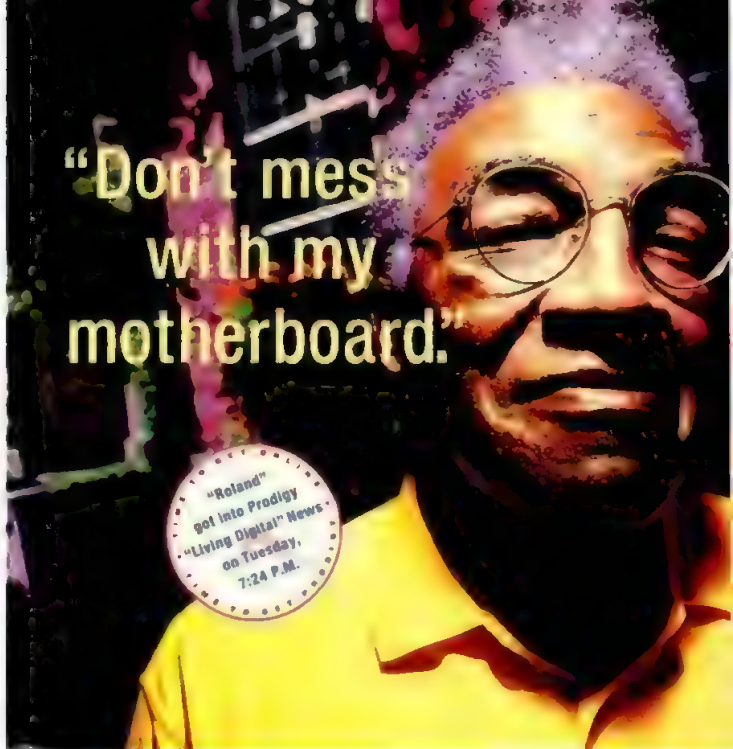
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Performance Tests: Networked CD-ROMs

What the Numbers Mean

Of the solutions reviewed, server-based NLMs took the top honors on our performance tests: Micro Design's SCSI Express for NetWare 2.1 zipped through our Database Search test, and TAC Systems' SCSI Shuttle opened up the throttle with the best throughput on the Multimedia Video test.

On the Database Search test, SCSI Express took an impressive 2 minutes 50 seconds, less than one-third the time of Microtest's DiscPort Tower. SCSI Express's closest competitors—JVC's CD Library Manager with the JVC CT-800 CD Tower, Stac's CD-QuickShare, and Logicaft's LanCD with the Logicaft XF4500 tower—took more than a minute longer to complete our search.

The database we used on our test, Computer Select, uses large word indexes for searching. The CD-ROM server scans these indexes during a database search and reads the resulting data sequentially from each CD. NLM-based products create file sets with an index of the CD-ROM directory structure on the server hard disk and translate the index to conform to the NetWare file system. This allows increased performance by using NetWare's multitasking, dynamic caching, and sharing capabilities. Although leveraging the network operating

system's services can give NLMs an edge over peer-to-peer systems, NLMs can also slow down a busy server as the NOS attends to file and print workloads. For non-NetWare environments or networks with overworked servers, LanCD and CD Library Manager (peer-to-peer solutions) offer the best performance and flexibility.

While NLMs returned the best performance on the Database Search test, we saw varied results on the Multimedia Video test. SCSI Shuttle, an average performer on our Database Search test, delivered the best Multimedia Video score, at 41 frames per second (fps).

Meanwhile, other NLM-based products fared poorly on the Multimedia Video test: the DiscPort Tower and SCSI Express each scored less than 21 fps, and CorelSCSI Network Manager was unable to complete the test.

Although video playback of 30 fps is the U.S. standard, playback over network traffic can often result in slowdowns or skipped frames. CD Library Manager, CD-QuickShare, DiscPort Pro, and LanCD all achieved scores of more than 30 fps on our Multimedia Video test.—*Analysis written by Jeffrey G. Witt*

How We Tested

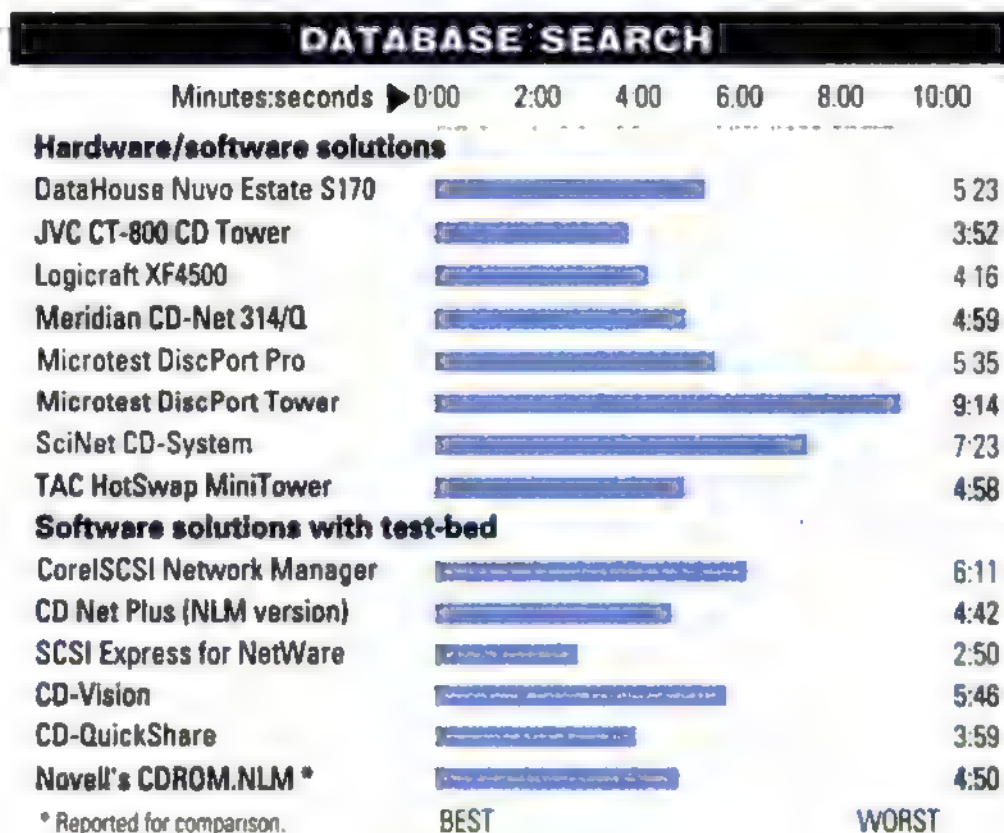
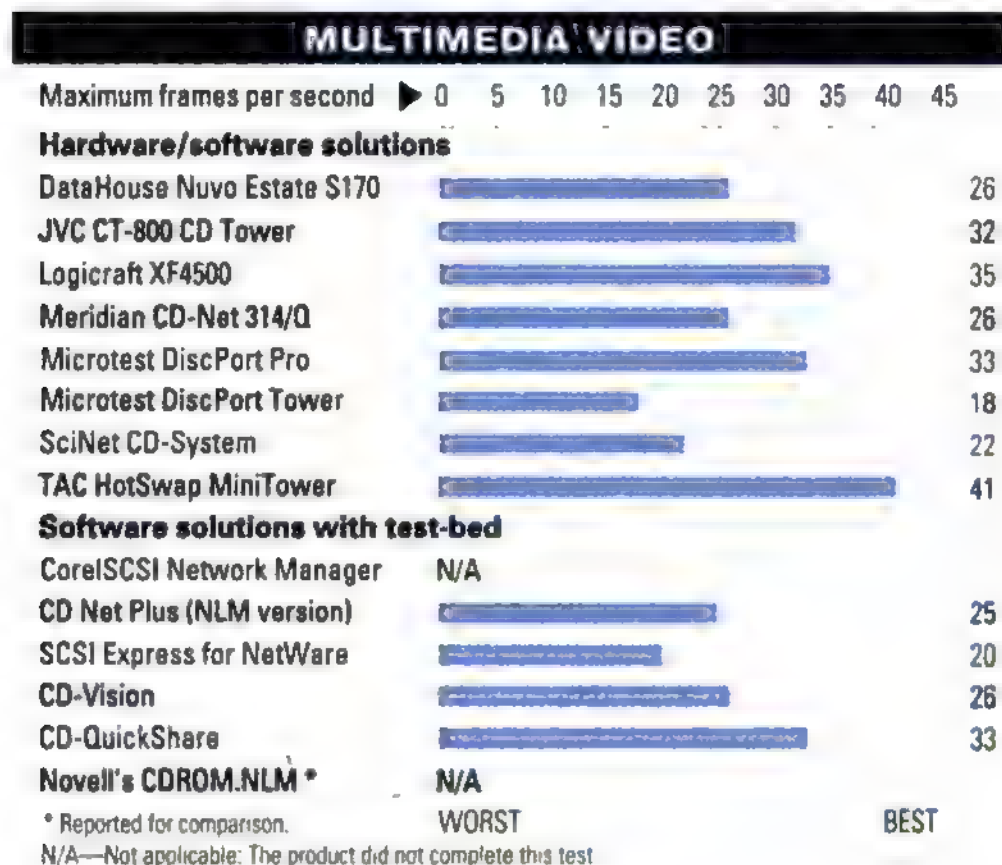
We tested each CD-ROM solution with the configuration submitted by the vendor. For NLM-

based products, we used NetWare 3.12 on an HP NetServer 5/66 LF with 32MB of RAM and, if available, the SCSI adapter and CD-ROM tower sold by the vendor.

For software-only NLM products, we used the Meridian NET ROM Tower and Adaptec's 1542 SCSI adapter. (We also tested Novell's CDROM.NLM and report its performance for comparison.) We installed products that required building a server from a PC on a Compaq ProLinx 486/33 with 16MB of RAM and 550MB of hard disk space.

The **Multimedia Video** test is part of Ziff-Davis Benchmark Operation's WinBench 96 test suite. We play the 32MB "Carousel" movie .AVI file from the CD server on an HP Vectra XU 5/90C client with Microsoft Windows for Workgroups and 16MB of RAM. The video clip contains 3,600 frames; results are recorded in frames per second, with higher frame rates indicating better performance. Our test allows the file to be played as fast as possible from the CD-ROM server, without sound, to measure best-case playback throughput.

For our **Database Search** test, we run four Compaq Deskpro 486/33 clients simultaneously accessing separate drives on the CD-ROM server. Each drive contains a separate copy of Information Access Co.'s database CD, Computer Select, which includes more than 70,000 articles from computer-related periodicals (including *PC Magazine*). We measure the time it takes for all four clients to complete a search with the Boolean expression "the AND (is a) OR at," which returns more than 50,000 matching documents. Shorter timings indicate better performance.



CHANGING THE RULES

Finally, while it uses a peer-to-peer implementation for sharing CDs, Stac's CD-QuickShare changes the rules by copying all your CD-ROMs to a hard disk and compressing the files. The obvious advantage of this approach is speed. No CD-ROM drive can match the access time and throughput of a hard disk. However, we found that copying CDs to the disk was very time-consuming, Stac's compression was less effective in some cases than others, and the performance difference was not as dramatic as we expected. This is probably because many CD packages already load some software on your hard disk, and our tests had multiple users accessing the same data at the same time. The obvious disadvantage of this solution is that it eats up hard disk space. Logicaft's XF4500 comes with a 9GB hard disk, and its software can copy your most-used CDs to that hard disk. There is no compression, however.

Networked CD-ROMs provide valuable files and information that anyone on the network can share. Fortunately you have several good CD-ROM-sharing solutions to choose from.

Around Technology Inc.

CD-Access One-in-One, DataHouse Nuvo Estate S170

For a low-priced file-server extension solution, consider CD-Access One-in-One (\$399). It works with NetWare 3.x and 4.x and is limited only by the number of users NetWare allows with no licensing fees. But it is not significantly better than Novell's CD-ROM NLM: It relies on NetWare for much of its administration and does not offer any client-access features beyond having CDs appear as volumes.

The solution we tested comprised the CD-Access One-in-One NLM and driver software, an Adaptec ISA SCSI card (\$89 list price), and the DataHouse Nuvo Estate S170 (\$2,468 list), a CD-ROM tower with seven Sanyo quad-speed drives sold by Around Technology. On our performance tests, this configuration fell in the middle of the pack as compared with other NLM solutions. CD-Access,

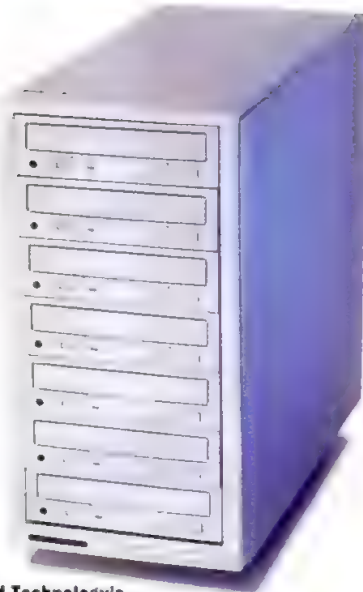
Around Technology's DataHouse Nuvo Estate S170 (\$2,468) comes with seven quad-speed Sanyo CD-ROM drives.

also sold separately, includes configuration and administration utilities. It works with most SCSI-based CD towers and all NetWare clients except the Macintosh.

The CD-Access NLM provides a NetWare-style menu interface for configuring and administering CD-ROMs. You can add or delete CDs and mount or dismount CD volumes from any client. But in this regard, CD-Access is only slightly better than Novell's CDROM.NLM (included with NetWare), which does not have a menu interface and makes you enter commands at the server. Much of the administration is done through NetWare: Access control for the networked CDs is provided via NetWare groups.

The networked CDs are accessible as volume-mapped drives from any NetWare client, including DOS, Windows 3.x, and Windows 95 clients. Because the CD drives appear simply as NetWare-mappable drives, users can simultaneously access local CD-ROMs using MSCDEX and networked CD-ROMs.

Each CD must be mapped as a separate volume; you can't assign multiple CDs to a single volume as with CorelSCSI Network Manager and Meridian's CD Net Plus. We found initial CD mounting times a bit slow, taking up to 2 minutes depending



on the size of the CD. This is because CD-Access creates a compressed virtual image of the CD's directory information and stores it on the file server's hard disk. CD-Access uses NetWare's disk caching, and all parameters are configurable through Syscon.

CD-Access comes with its own INSTALL.NLM on the installation disk; it provides simple menus for easy installation. If you choose, the install program can modify the AUTOEXEC.NCF file to load on boot-up; otherwise, you can use CD-Access's own .NCF file. When you add CDs, CD-Access allows administrators to modify the volume name, its owner, and the groups that can access it.

Around Technology, formerly Procomp USA, also makes the Tachyon 66X CD Server and several other CD towers. The Tachyon server was not reviewed in this roundup because it uses software licensed from Logicaft Information Systems.—Arun R. Desai

CD-Access One-in-One. List price: \$399 (unlimited users). **DataHouse Nuvo Estate S170.** List price: \$2,468. Around Technology Inc., 6777 Engle Rd., Suite J, Middleburg Heights, OH 44130; 216-234-6402; fax, 216-234-2233; e-mail, 72113.3626@compuserve.com.

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Corel Corp.

CorelSCSI Network Manager

CorelSCSI Network Manager, an NLM-based file-server extension package, works only with NetWare 3.x and does not support Windows 95 clients. It has the typical NetWare server-based administration interface and includes optional hard disk caching for each CD-ROM for increased performance, but it also required a longer-than-usual initial mount time for each CD.

A software solution for networking any

SCSI device, CorelSCSI Network Manager (\$595 list) works not only with CD-ROM drives but also with optical jukeboxes, WORM drives, and hard disks. The package also includes CorelRAID, which provides software-based Levels 4 and 5 RAID for NetWare.

SUITABILITY TO TASK

CD-Access One-in-One

Setup and installation	Good
Administration and management	Fair
Scalability	Fair
Client access	Fair

SUITABILITY TO TASK

CorelSCSI Network Manager

Setup and installation	Good
Administration and management	Good
Scalability	Fair
Client access	Poor

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Sharing CDs with Your NOS

By Steve Rigney

Most of the products we review in the main feature make it easy to share CD-ROM drives on the LAN. But if your needs are relatively modest, you may be perfectly satisfied using the CD-ROM-drive-sharing capabilities built into your NOS.

Almost every peer-to-peer and server-based network operating system lets you install multiple CD-ROMs in your server and share the drives with other users. But you won't find as many advanced features in the operating system as you will in third-party packages, such as the ability to combine several CDs into a single network drive letter or volume label.

IBM OS/2 LAN Server, Microsoft Windows NT, and NetWare all allow you to share as many CD-ROMs as you can attach to the SCSI adapters in your server. You can usually add four SCSI adapters to a single PC and daisy-chain up to 24 CD-ROM drives.

NETWARE

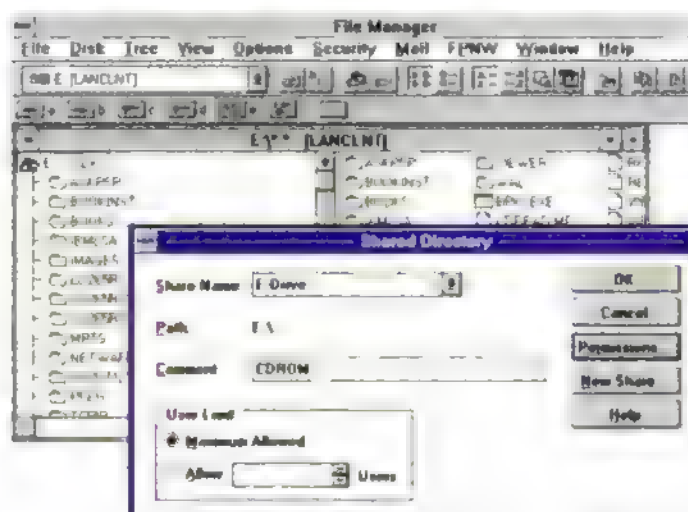
A useful feature that first appeared in NetWare 3.12 and remains in NetWare 4.1 is a CD-ROM NLM that lets you attach CD-ROM drives to your server and share individual CDs as NetWare volumes. After you mount the CD through the NLM, users can map a drive letter to the CD and access the information in the same way they access any other volume on a NetWare file server.

As with any NLM, however, each CD that you add requires you to add more RAM in your server. The amount could be as much as 1MB or 2MB per disk, depending on the number of directories and file entries on the CD. Also, if your NetWare server is already loaded up with NLMs, adding another one may cause instability or other complications.

One of the biggest drawbacks of Novell's CDROM.NLM is that it has very specific hardware and software requirements. For example, it will work only with SCSI adapters that comply

with the Advanced SCSI Programming Interface (ASPI) specification. While most newer SCSI adapters are ASPI-compliant, you will be unable to use an older SCSI adapter. And you're going to be out of luck when it comes to sharing IDE-based CD-ROM drives.

After you have made sure that your hardware will work, you will need to check the version numbers of your



To share a CD-ROM drive attached to a Windows NT server, just select the Disk | Share As command in File Manager, then set the properties for the shared directory.

NLM drivers. The CD-ROM NLM requires new versions of specific NLMs, including CLIB and ASPI-TRAN. If the CD-ROM NLM doesn't recognize your drive, you might need to upgrade these NLMs. These hardware and software requirements make the NetWare CD-ROM NLM difficult to install and configure.

NetWare's command-line CD administration utility is functional but basic. You cannot combine several CDs under a single volume label, and you must manually mount a CD every time you insert it into a drive. One welcome feature is that you can use the NetWare Rconsole remote-control utility to mount and dismount CDs from a remote location; neither LAN Server nor Windows NT Server provides a similar utility.

The first time you mount a CD-ROM in your NetWare server, it takes several minutes for NetWare to create a FAT and directory information for that CD. Fortunately, the second time

you insert the CD, it takes only a few seconds because the information has already been cached. You can also configure NetWare to cache the information to the hard disk to provide faster access in the future.

MICROSOFT WINDOWS NT SERVER

Like NetWare, Windows NT treats CD-ROM drives as standard network drives. However, unlike NetWare, it is a snap to share a CD-ROM on a Windows NT server. Using File Manager, you simply select the drive letter of your CD drive. Then from the Disk menu, choose the Share As command to create a shared resource.

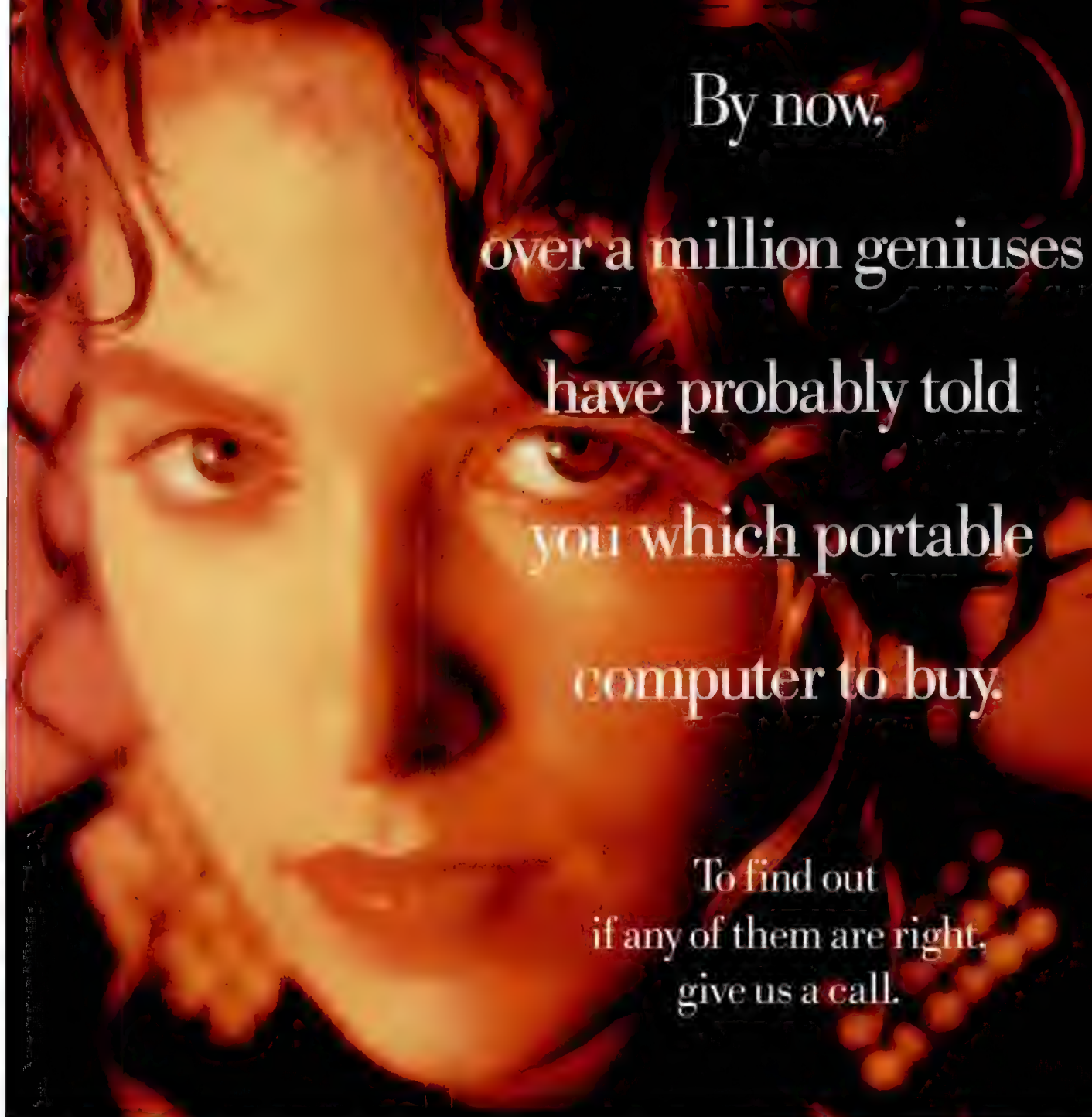
The management options are, as in NetWare, somewhat limited. Windows NT lets you map only one drive letter per CD-ROM. You can make the resource available to everyone or set up individual security, and you can also select the maximum number of users who can access the drive.

You must make sure that you have Windows NT drivers for your SCSI adapter and CD-ROM. But unlike NetWare, Windows NT will work with some IDE CD-ROM drives. Windows NT does not copy the FAT or directory contents of the CD to the hard disk, but it does use your server's memory to cache the CD-ROM drive.

OS/2 LAN SERVER

OS/2 LAN Server is not a full-scale NOS but rather an application that runs on top of the OS/2 operating system. To share your CD on a LAN Server network, you must be able to access the CD-ROM using OS/2. If OS/2 can see the CD-ROM drive, you can share it on the network.

As in Windows NT, it is extremely easy to share a CD-ROM with LAN Server. You just select the drive letter of the CD, then drag and drop it over the shared-resource folder. When you right-click on the CD drive's icon in the shared-resource folder, you can configure access rights.



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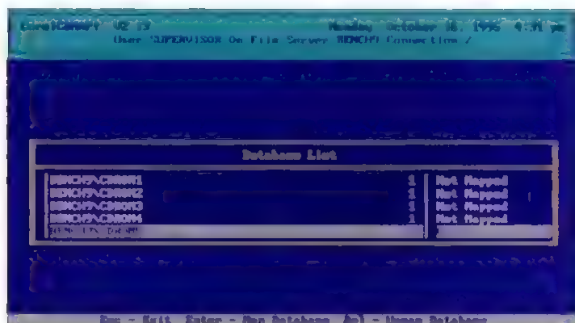
Order per Bar 17cm Monday, Friday, 40cm 5cm Cat 100, Further 100

1. Definition: A function $f: X \rightarrow Y$ is called a linear map if it satisfies the following two properties:

 (a) $f(x + y) = f(x) + f(y)$ for all $x, y \in X$.

 (b) $f(\alpha x) = \alpha f(x)$ for all $x \in X$ and $\alpha \in \mathbb{R}$ (or $\mathbb{C}$).

 If f is a linear map, then $f(0) = 0$.



With Corel's CDSVR NLM you set up Databases, which are volumes that can include one or more CD-ROM devices.

When we tested CorelSCSI with our standard CD-ROM tower test-bed, it could not complete our Multimedia Video test (the Corel software on our Windows for Workgroups clients caused GPFs with large video files), and its performance was below average on the Database Search test.

The server software installs from a DOS client logged on as a NetWare supervisor. After setting up the NLM, the install program also copies CorelSCSI Network Manager client software to the server. To install Corel's client software under DOS or Windows 3.x, you log on to the server and run the DOSSETUP program for each client. Corel plans to have Windows 95 and Macintosh client software available next year.

Three DOS client programs are required: CORELCDX, a proprietary replacement of MSCDEX; CDMAP, to map networked CD drives; and CDCON, to configure access rights for CD database users. Corel's CORELCDX by default disables clients' local CD access; to access local CD-ROM drives the client configuration (CRLSCSI.INI) files must be changed manually, using hard-to-find documentation. And though the software worked properly, it does not use Windows DLL-based utilities, so you must map the drives before loading Windows. Once in Windows, the drives are represented by the letters you've assigned them.

With Corel's NLM, called CDSVR, you set up Databases, which are volumes that include one or more CD-ROM devices. You are thus not limited to one CD per drive letter. The server allows hard disk caching, which gives you the option of preallocating disk space for each CD. The disk-caching option increases the

initial CD-drive mount time significantly; some CDs took 3 to 4 minutes to mount. Corel's Cache Info menu lets you analyze cache usage to optimize your settings.

—ARD

CorelSCSI Network Manager. List price: \$595 (unlimited users). Corel Corp., 1600 Carling Ave., Ottawa, Ontario, Canada K1Z 8R7; 800-772-6735, 613-728-8200; fax, 613-761-9176; e-mail, cust

serv@corel.ca; Web, <http://www.corel.ca>. Circle 465 on reader service card

JVC Information Products Co. of America

CD Library Manager, CT-800 CD Tower

Though JVC's CD Library Manager offers a NOS-independent, peer-to-peer solution for networking CD-ROMs, its client software is limited to Windows 3.x. And though the server software installs easily and includes good management tools, it is fairly expensive at \$1,595 list. Also, client installation is unwieldy; users must add a TSR to each PC along with the Windows software.

CD Library Manager runs on a 486-based or better PC over an IPX, NetBIOS, or VINES network independently of the network operating system. We tested CD Library Manager with JVC's CT-800 CD Tower (\$4,345), which comes with seven quad-speed Toshiba XM-3501B CD drives and connects to a workstation via a SCSI adapter. You can also use your own stack of individual drives or auto-changer devices.

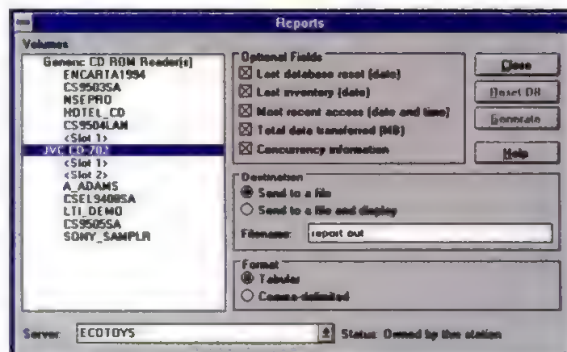
Clients must access the server using CD Library's TSR and either DOS or Windows management software; the TSRs won't work with Windows 95. The Windows 3.x software lets clients map and unmap CD drives to client drives from the available applications. Once mapped, the drives look just like any other drives in File Manager. You must always map

drives using the CD Library Manager client software.

The client Windows software doubles as management software for CD Library Manager. When it is installed as an administrator client, Administration and Applications menu items appear. From these menus you can perform most of the same management functions that you would from the PC server console. Unlike the other products reviewed here, CD Library Manager includes an extensive reporting feature that allows you to output a wide variety of server and usage statistics.

The CD Library Manager server software installs easily but with a few hiccups. During installation, you must manually enter each of the SCSI host ID numbers and specify the device drive type. Other products, such as Microtest's DiscPort Pro, automatically sense the device, its location, and the drive type.

CD Library gave us trouble when we tried to change CDs on the fly. Using the PC Server management software to eject a



JVC's CD Library Manager has the most powerful reporting features of the products we reviewed.

SUITABILITY TO TASK CD Library Manager

Setup and installation	Good
Administration and management	Good
Scalability	Good
Client access	Fair

CD worked fine, but when we inserted a new disk the system refused to recognize the title until the server was rebooted. JVC says that a maintenance release of CD Library Manager, available by the time you

read this, will fix the problem. JVC's CD Library Manager will appeal to smaller workgroups wanting to share drives or access the same CD titles. Although it's a promising system, JVC should offer DOS and Windows 95 support to make this a useful product for most computing environments.—Tony Pompili

CD Library Manager 1.0. List price:

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24 COVETED CDS.
17 SECONDS UNTIL THE
FIGHT BREAKS OUT.**



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SUMMARY OF FEATURES

Networked CD-ROM Servers: Hardware

PC MAGAZINE
EDITOR'S CHOICE

	Around DataHouse Nuvo Estate S170	JVC CT-800 CD Tower	Logicaft XF4500	Meridian CD Net 314/Q	Meridian CD NET ROM	Microtest DiscPort Pro	Microtest DiscPort Tower
■ YES ■ NO							
List price (tested configuration)	\$2,488	\$4,345	\$24,020	\$10,510	\$3,320	\$1,595	\$3,195
Bundled software (see software features table)	CD Access One-in-One	CD Library Manager 1.0	LanCD 3.1	CD Net Plus 8.0	CD Net Plus 8.0	DiscView Pro	DiscView Pro
Processor and speed (MHz)	None	None	486DX2/66	486DX/50	None	None	None
Bus type	N/A	N/A	EISA	ISA	N/A	N/A	N/A
Standard RAM/Maximum RAM	N/A	N/A	32MB, 32MB	16MB, 16MB	N/A	N/A	N/A
Number of hard disks	None	None	1	None	None	None	None
Hard disk size	N/A	N/A	9GB	N/A	N/A	N/A	N/A
Floppy disk drive	■	■	■	■	■	■	■
Maximum number of logical devices supported	N/A	N/A	28	128*	7	600	600
Supports IEEE 802.3/IEEE 802.5 standard	■ Optional	■ Optional	■ Optional	■ Optional	■ Optional	■ Optional	■ Optional
Includes BNC/DB-9 connector	■	■	■	■	■	■	■
Includes RJ-45/RS-232 connector	■	■	■	■	■	■	■
Supports 10Base2/10Base5 cabling	■	■	■	■	■	■	■
Supports 10Base-T (UTP) cabling	■	■	■	■	■	■	■
CD-ROM Drives							
Number of CD-ROM drives	7	7	14	7	7	4	4
CD-ROM drive manufacturer	Sony	Toshiba	Plextor	Toshiba	Toshiba	Sony	Sony
Data-transfer rate	600 Kbps	600 Kbps	600 Kbps	640 Kbps	640 Kbps	600 Kbps	600 Kbps
Rated access time	170 ms	150 ms	170 ms	190 ms	190 ms	200 ms	200 ms
Buffer size	256K	256K	256K	256K	256K	256K	256K
ISO-9660 CD support (PC)	■	■	■	■	■	■	■
HFS CD support (Macintosh)	■	■	■	■	■	■	■
XA/Photo CD multisection support	■	■	■	■	■	■	■
Technical Support							
Warranty (parts and labor)	1 year	1 year	1 year	1 year	1 year	1 year	1 year
Toll-free number	None	800-828-1582	800-308-8750	800-755-8324	800-755-8324	800-526-9675	800-526-9675
Toll number	218-234-8402	714-281-1292	803-880-0300	408-481-5128	408-481-5128	602-952-6650	602-952-6650
Technical-support hours (eastern time)	8:30-5:00 M-F	9:00-5:00 M-F	9:00-6:00 M-F	10:00-8:00 M-F	10:00-8:00 M-F	9:00-8:00 M-F	9:00-8:00 M-F

N/A—Not applicable. The product does not have this feature.

* Meridian CD Net 314/Q supports a maximum of 98 logical devices when used with CD Net Plus 8.0.

\$1,595 (unlimited volumes). **CT-800 CD Tower.** List price: \$4,345. JVC Information Products Co. of America, 17811 Mitchell Ave., Irvine, CA 92714; 714-261-1292; fax, 714-261-9690; e-mail, 74160.1457@compuserve.com.

Circle 466 on reader service card

Logicaft Information Systems Inc.

LanCD, Logicaft XF4500

LanCD's server independence, high capacity, and flexible client software offer a wide range of configuration possibilities. However, as with all peer-to-peer systems, be prepared to spend time setting up users with the LanCD client. The Logicaft XF4500, a PC-based CD server that runs the LanCD software, is a fast, high-volume CD tower that lets you copy entire CDs to its 9GB hard disk for

fast access, but at \$24,020 it's a very expensive solution. You will want to consider putting LanCD, sold separately for \$1,395, on your own PC and SCSI CD ROM drive stack.

LanCD bypasses servers using IPX, NetBIOS, TCP/IP, or VINES protocols. It is a powerhouse for serious CD user sites, capable of handling up to 56 SCSI devices and CD jukeboxes.

We tested LanCD with the Logicaft XF4500 server, a powerful, 3-foot-high box for the busiest of networked CD clients. The XF4500 includes a built-in 486/66-based PC complete with keyboard, monitor, network adapter, 14 quad-speed Plextor CD-ROM drives, and 9GB of hard disk space. (The XF5500 model, which will have a Pentium/90 processor, should be available by the time you read this.) The

server uses its hard disk for caching, and by using the optional FastCD feature (included with the XF4500, but \$600 extra if you purchase LanCD separately), the hard disk

can also be a quasi-CD. FastCD uploads the entire CD to the hard disk for fast access.

Installing the Logicaft XF4500 or LanCD on a networked PC is fast and simple: Just provide a name for the server and specify cache size

and other basic parameters. After the server is up and running, you use the Windows LanCD Server Manager to do management tasks, such as ejecting CDs or rebooting a LanCD server. As with the DiscPort or JVC management software, you can manage multiple servers from within the LanCD Manager. You can also use the Server Manager to add user licenses.

While server setup is a snap, getting

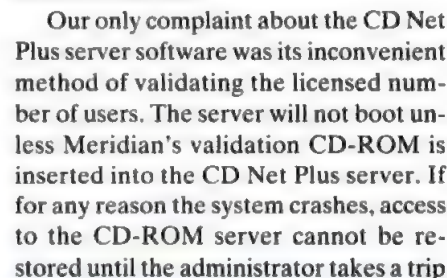
SUITABILITY TO TASK

LanCD

Setup and installation	Fair
Administration and management	Good
Scalability	Good
Client access	Good

We were unable to use LanCD on Windows 95 or Windows NT Workstation PCs. Version 3.2 of LanCD, which should be available by the time you read this, will include clients for these OSs and for the Macintosh.

The CD Net Plus 6.0 server software is available in several flavors. As a software-only solution (\$895 list price for ten users) it can be installed either on a DOS machine in a peer-to-peer setup on an IPX network or on a NetWare server as an



SUMMARY OF FEATURES

Networked CD-ROM Servers: Software

	Around Technology Inc. CD Access One-in-One	Corel Corp. CorelSCSI Network Manager	JVC Information Products Co. of America CD Library Manager 1.0	Logicaft Information Systems Inc. LanCD 3.1	Meridian Data Inc. CD Net Plus 6.0	Microtest Inc. DiscView Pro	Micro Design International Inc. SCSI Express for NetWare 2.1	Ometix Network Products CD-Vision with CD-Commander
■ YES ■ NO								
List price/Vendor's estimated street price	\$399, N/A*	\$595, \$450	\$1,595, N/A*	\$1,395, \$1,185	\$895, \$795	N/A**	\$995, \$845	\$945, \$900
ISO-9660 CD support (PC)	■	■	■	■	■	■	■	■
HFS CD support (Macintosh)	■	■	■	■	■	■	■	■
Supports IDE/SCSI CD-ROM drives	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Supports CD changers	■	■	■	■	■	■	■	■
Client interface	DOS	DOS	Windows	DOS, Windows	DOS	DOS, Windows	DOS	DOS, Windows
Requires software on clients	■	■	■	■	■	■	■	■
Uses client TSR files	■	■	■	■ ¹	■	■	■	■
Supports NetWare 3.x/4.x	■ ■ ²	■ ■	■ ■	■ ■	■ ■ ²	■ ■ ²	■ ■ ²	■ ■ ²
Uses server NLM	■	■	■	■	Optional	■	■	■
Emulates NetWare file server	■	■	■	■	■	■	■	■
Can cache CDs to clients	■	■	■	■	■	■	■	■
Virtual drive mapping (one letter, many drives)	■	■	■	■	■	■	■	■
Can launch CD-ROMs without changing drives	■	■	■	■	■	■	■	■
Maintains a catalog of loaded CD-ROMs	■	■	■	■	■	■	■	■
Automated CD-ROM application launcher	■	■	■	■	■	■	■	■
Balances user load among multiple duplicate CDs	■	■	■	■	■	■	■	■
Client OS Support								
DOS 6.0/Windows 3.x	■ ³ ■ ³	■ ■	■ ■	■ ■	■ ■	■ ³ ■ ³	■ ³ ■ ³	■ ³ ■ ³
OS/2 2.11, Warp 3.0	■ ³ ■ ³	■ ■	■ ■	■ ■	■ ■	■ ³ ■ ³	■ ³ ■ ³	■ ³ ■ ³
Macintosh System 7	■	■	■	■	■	■	■	■
Windows 95	■ ³	■	■	■	■	■ ³	■ ³	■ ³
Windows NT Workstation 3.51	■ ³	■	■	■	■	■ ³	■ ³	■ ³
Protocol Support								
IPX/SPX	■	■	■	■	■	■	■	■
NetBIOS/NetBEUI	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Native TCP/IP	■	■	■	■	■	■	■	■
Winsock-compliant	■	■	■	■	■	■	■	■
AppleTalk	■	■	■	■	■	■	■	■
Disk Access								
Maximum number of CD-ROM volumes	63	Depends on NOS	Depends on NOS	1,280	56	Depends on NOS	64	196
Maximum number of servers per client	Depends on NOS	Depends on NOS	6	10	29	Depends on NOS	Depends on NOS	Depends on NOS
Maximum number of drives per server	Depends on hardware	Depends on hardware	392	56	56	Depends on hardware	Depends on hardware	Depends on hardware
Maximum number of users per server	Depends on NOS	Depends on NOS	Depends on NOS	100	149	Depends on NOS	Depends on NOS	250
Maximum concurrent users per disk	Depends on NOS	Depends on NOS	Depends on NOS	100	149	Depends on NOS	Depends on NOS	250
Security and Administration								
Management console	Server	Server	Client and server	Client and server	Client	Client and server	Client and server	Client and server
Administrator can view server activity	■	■	■	■	■	■	■	■
Administrator can change server parameters	■	■	■	■	■	■	■	■
Administrator can lock/unlock CD-ROMs	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Administrator can set up/monitor licensing	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Administrator can eject CD-ROMs	■	■	■	■	■	■	■	■
Technical Support								
Warranty (parts and labor)	1 year	Lifetime	1 year	1 year	1 year	1 year	1 year	Lifetime
Toll-free number	None	None	800-828-1582	800-308-8750	800-755-8324	None	800-228-0891, ext. 149	800-965-6650
Toll number	216-234-6402	613-728-1010	714-261-1292	603-880-0300	408-461-5128	602-952-6650	407-677-8333, ext. 149	408-383-7050
Technical-support hours (eastern time)	8:30-5:00 M-F	8:30-5:00 M-F	9:00-5:00 M-F	8:00-6:00 M-F	10:00-8:00 M-F	9:00-8:00 M-F	8:00-8:00 M-F	11:00-8:00 M-F

N/A*—Not applicable: The vendor does not disclose an estimated street price.

¹ The product uses TSRs for the DOS version only.

² The product supports NetWare 4.x in Bindery-emulation mode only.

³ The product supports this OS through a NetWare client only.

N/A**—Not applicable: This software is bundled with DiscPort Pro (\$1,595 list) and with DiscPort Tower (\$1,395 list). It is not sold separately.

SciNet Inc. CD-Manager 2.2	Stac Electronics CD-QuickShare	TAC Systems Inc. SCSI Shuttle for NetWare 4.0
\$495, \$445	\$750, \$535	\$1,295, \$1,100
		
		
 	 	 
		
DOS	Windows	DOS
		
 	 	 
  ²	  ²	  ²
		
		
		
		
		
		
		
		
		
		
		
		
 ³  ³	 	 ³  ³
 ³  ³	 	 ³  ³
		 ³
 ³		 ³
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24	Depends on NOS	Depends on NOS
Depends on NOS	Depends on NOS	Depends on NOS
24	Depends on hardware	Depends on hardware
250	Depends on NOS	Depends on NOS
250	Depends on NOS	Depends on NOS
Client and server	Client and server	Server
		

to the server closet with the validation CD.

Meridian's DOS or Windows client software is required to access a CD Net server. Although a TSR is included for DOS clients, CD Net's mapping and program features are lost with the DOS client. Mapping CD-ROM volumes is easy with CD Map, included as part of the Windows client.

The CD Net Plus server has a menu-based DOS console that displays server statistics such as caching and CD-ROM volume information. You can tune parameters such as load balancing among multiple copies of the same CD, software license metering, and user access restrictions.

Administrative utilities consist of two Windows programs: CD Access and CD Admin. CD Access uses a unique method involving volume groups—not to be confused with NetWare's user groups—to control user access. CD Access creates groups of multiple CD-ROM volumes to which you assign access rights.

CD Admin lets administrators create program items that automatically map CD-ROM volumes when a user launches an application. CD Menu allows clients to access a list of available CDs and can also export list items as Windows icons.

CD Net also offers what Meridian calls *server-independent mapping*. Because the CD Net software identifies a disk by its volume title, it can map to a client regardless of which server it's on or which drive it's in. That way you don't need to worry about putting the same disk in the same drive each time you swap CDs.

The CD Net turnkey server we tested, the 314/Q, has a 486SX/33 processor, 16MB of RAM, 14 quad-speed drives, and either an Ethernet or Token-Ring connection, but no hard disk. The 314/Q server boots from a single floppy disk (not lockable) with DOS and CD Net Plus software. Once the server boots and scans the validation CD, both it and the floppy disk can be removed—but you'll need both of them again if you

SUITABILITY TO TASK

CD Not Plus

Setup and installation	Excellent
Administration and management	Good
Scalability	Good
Client access	Excellent

restart or shut down the server.—*Charles Lin*

CD Net Plus 6.0. List price: \$895 (10-user license). **CD Net 314/Q.** List price: \$10,510. **CD NET ROM.** List price: \$3,320.

Meridian Data Inc., 5615 Scotts Valley Dr., Scotts Valley, CA 95066; 00-767-2537, 408-438-3100; fax, 408-438-6816; Web, <http://www.meridian.com>

Circle 468 on reader service card

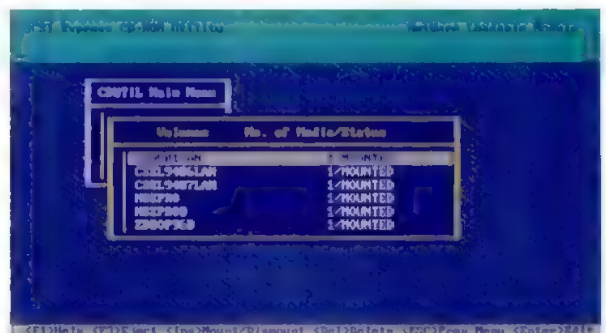
Micro Design International Inc.

SCSI Express for NetWare

A good NLM-based solution for sharing CD-ROM drives over busy networks, SCSI Express for NetWare produced the best score on our Database Search test. However, although SCSI Express was easy to install, its management tools were only fair.

SCSI Express for NetWare runs as an NLM on a NetWare 3.x or 4.x server in Bindery emulation. As with other software-only products such as CorelSCSI Network Manager, you supply your own CD drives and SCSI interface. In fact, SCSI Express can provide network access to nearly any SCSI device, including magneto-optical and tape backup devices. We tested SCSI Express with NetWare 3.12 on an HP NetServer 5/66 LF using the built-in Adaptec SCSI adapter and our CD-ROM tower test-bed.

CD-ROM drives appear as network drives to clients, so connecting to a CD-ROM drive through SCSI Express is just a matter of mapping a drive. Like other NLM products, this is especially useful when you have numerous NetWare users and you don't want to install CD-ROM



SCSI Express's NetWare console program, CDUTIL, lets you perform the usual CD mount, dismount, and eject functions.

access software on each client. But because it's an NLM, it will require additional resources on your server.

Speed demons will appreciate SCSI Express's impressive multiuser access performance. It had the fastest search time of the products tested on our four-user, four-volume Database Search test: 2 minutes 50 seconds, nearly half the 6 minutes 11 seconds that CorelSCSI took on

the same hardware configuration.

Installing SCSI Express is fairly painless, especially if you already have a SCSI adapter installed on your NetWare server. An NLM installer program lets you set up SCSI Express from the server console. Once it found our drives, it let us select the appropriate device driver (in this case, CD drives). SCSI Express also includes drivers for other device types.

You manage SCSI Express either by using its NetWare console program, CDUTIL, or from a client using the Windows-based SE-View. Both programs let you perform the usual mount, dismount, and eject functions, as well as set operating parameters. You can also use these utilities to designate users and group access rights to the CD drive volumes instead of using NetWare's Syscon and

CD-ROMs Worth Sharing

By Ted Needleman

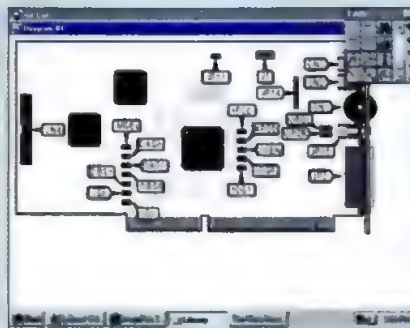
Now comes the hard part: choosing which CDs to share on your LAN. Though many CD-ROM products have pricing schemes geared toward LANs, many others—including the CD-ROM edition of *PC Magazine*, Corel Gallery 2 collection of clip art, and numerous consumer-oriented reference products—have licensing provisions that prohibit shared use.

If you're thinking of putting a CD-ROM product on the network, check the license agreement. And even if the agreement you accepted by opening the package precludes network use, a call to the vendor may get you permission to pop the disk into a networked drive.

One of the handiest CD-ROMs to have on your network is a disk-based telephone directory. You can always dial directory assistance—but that's a lot of calls if you're trying to get a list of every florist in Atlanta. **Net Phone**, from Pro CD (800-992-3766), is a version of Pro CD's national directory that is specifically optimized for network use. Priced at \$1,999 for up to 5 simultaneous users and \$12,999 for 50 users, Net Phone includes 95 million residential and business phone listings, searchable by various fields such as business type, area code, or ZIP code.

PhoneDisc '95, from Digital Directory Assistance (800-284-8353), has similar capabilities. Network pricing was unavailable at press time.

In case you need a street map to go with the address, DeLorme (207-865-1234) will be offering a network version of its Street Atlas USA 3.0, available by the time you read this. (Pricing



Micro House Technical Library contains many useful diagrams, including the sound board jumper diagram shown above.

was unavailable at press time.) This handy disk lets you zoom in to a street-level map of almost every city and town in the United States.

Support material is another good bet for networked CD-ROMs. Developers and PC support departments will love **Microsoft TechNet** (\$699) and **Microsoft Developer's Network** (\$1,495), from Microsoft Corp. (800-426-9400). TechNet is a compilation of Microsoft's technical-support materials, while Developer's Network is a collection of all the utilities that Microsoft has collected to enhance its programming language products.

The Computer Library Division of Information Access Co. (800-827-7889) has several products for information-hungry network users. **Computer Select** is an extensive database of more than 70,000 computer-related articles and abstracts that is updated monthly. Computer Select is available in one-user (\$2,395), three-user (\$4,995), and six-user (\$8,995) versions. **Support on Site**, which provides vendors' support

databases for applications and for networks, is priced identically for one-user (\$2,395) and three-user (\$4,995) versions.

Your PC and network support department will love **Micro House Technical Library** from Micro House (800-926-8299). This comprehensive encyclopedia of motherboards, hard disks, NICs, and I/O cards is available in single-user (\$699), three-user (\$1,499), five-user (\$2,399), and ten-user (\$4,199) versions.

Besides computer reference, you can find hundreds of specialized CD-ROM products for doctors, lawyers, and accountants. The famous *Thomas Register*, a guide to American manufacturers, is available in disk format as Knight-Ridder Information on Disc/Thomas Register, from Thomas Online (212-290-7291). A year's subscription with two updates annually costs \$1,495 and includes the *Thomas Food Industry Register*.

If your organization does political lobbying or fund-raising, check out **Voters on CD-ROM**, from Aristotle Publishing (800-243-4401). For \$1,000 plus 2 cents per voter (maximum price \$11,000), with no user limitations, you get a database of all U.S. registered voters, along with search software.

Perhaps more enjoyable is a set of 500 high-quality photos on CD-ROM. **KPT Power Photos I** or **KTP Power Photos II**, from MetaTools (805-566-6200). For \$199 each, you can add a professional look to your brochures and newsletters. KPT Power Photos includes an unlimited user license but you can't resell the photos.

Gateway 2000



Portable PCs



I needed out. My buddies in the programming lab were getting to me. So I tossed my Gateway Solo™ S120 Best Buy multimedia notebook into my pack and headed for the desert. Nothing like a little hot earth to clear the mind.

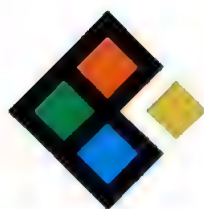
Man, I love this machine!

There I was. Miles from anywhere, just working away. Thinking — *man, I love this machine!*

Everything I need, right at my fingertips. A powerful 120MHz Intel® Pentium® processor, active matrix SVGA color display, 16MB RAM, whopping 1.2GB hard drive, and CD-ROM drive — it's high-end desktop power in a portable PC.

Perched on a rock, jamming to my favorite tunes (thanks to the 16-bit sound stereo speakers and CD-ROM drive), I watched the moon begin its journey across the night sky.

Off in the distance I saw headlights and heard the whining of an engine begging for a tune-up. Soon a battered old truck screeched to a halt in front of me. Over the dull roar of honky-



GATEWAY2000
S O L O

tonk music I heard, "Need a lift buddy?" Sure, why not.

"My name's Ned. And this here's Chuck."

He gestured to the armadillo curled up next to him. "I'm in 'crete." 'Crete? "Yea, lots of

opportunity in concrete. Spend a lot of time on the road. But I like it that way. Say you got yourself a pretty nifty Gateway 2000® notebook.



Gateway Solo notebooks are optimized for Microsoft® Windows® 95.

Me too. Wouldn't make a move without Sally here," Ned smiled as he patted the Gateway Solo V75 notebook sitting on the dash. Sally? "That's what I call her, after a certain waitress in Tucson," Ned winked at me. "Sally's

loaded. She has a 75MHz

Pentium processor, 8MB RAM,

540MB hard drive, and CD-

ROM drive." He winked at me again.

Ned named his portable Sally.

"It has all the features I need while I'm on the road. Isn't that right Chuck?



EZ Pad™ pointing device for easy cursor navigation.

"I'm mighty fond of Gateway 2000. Best values in portable PCs around," smiled Ned. "And their portable line has something for everyone."

More cc more

The radio droned on as Ned, Chuck and I continued on our trek through the dark desert.

Armadillos like to have their heads rubbed. At least Chuck did. Up ahead I saw the neon sign of a roadhouse — a beacon in the darkness.



"I could use some grub. How 'bout you?" asked Ned as he pulled the truck into the dirt parking lot.

There she stood in all her glory. Tiara and satin dress shimmering beneath the fluorescent lights. "Next tour's in 15 minutes, honey," she said. Tour? "My name's Delilah, and I give the best moonlit desert tours in the West. Is that a Gateway

computing, places.

Solo
note-
book?"

she asked
eyeing my portable.



"I have a Gateway Liberty small notebook.

It's packed with fabulous features like a 540MB removable hard drive, and it weighs

*Gateway Solo models
feature two integrated
stereo speakers.*

a mere 4.2 pounds!

Why, this glorious PC has won nearly as many awards as I have! And the best part," Delilah leaned in closer. "Its

THE DESERT QUEEN'S

desert tours



\$25

"The *best* darn tours
in the West!"

huge 10.4-inch color screen is dual-scan for extra privacy." I suppressed the urge to ask the Desert Queen

about the secrets she was keeping from the world.

"Honey, the folks at Gateway 2000 are just great. Can you

The folks at Gateway 2000 are just great.

believe that each system gets 24-hour, seven-day-a-week telephone technical support? And their values just can't be beat," said Delilah with a far off look in her eyes. I had a feeling my adventures were just beginning.

For more computing, more places —
call Gateway 2000 today.



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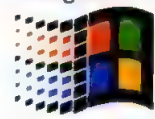
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Networked CD-ROMs

NWAdmin (though you can still manage user and group rights directly through NetWare if you prefer).

Windows users can use SE-View to manage SCSI Express CD drives. In case you're about to run out of drive letters, SE-View allows you to group CDs under a single drive letter. To the user, these combined CD trees look just like subdirectories. With a single drive letter you can access up to 200 CD-ROM titles; however, the user must have SE-View installed and properly configured for this feature to work.

SE-View can centrally manage CD applications, although this feature is more limited than similar features in other programs reviewed. As with JVC's CD Library Manager, you can create batch files to run Windows applications. But these batch files can be run only as menu items from SE-View or File Manager; you can't launch them from Windows icons as you can with Microtest's SmartLaunch application.—TP

SCSI Express for NetWare 2.1. List price: \$995. Micro Design International Inc., 6985 University Blvd., Winter Park, FL 32792; 800-228-0891, 407-677-8333; fax, 407-677-8365; e-mail, sales@microdes.com; Web, <http://www.microdes.com>.

Circle 469 on reader service card

Microtest Inc.

DiscPort Pro, DiscPort Tower



Microtest provides the best CD-sharing solution of all the products we reviewed, combining the convenience of an NLM with the flexibility of server-independent CD-ROM drives. The DiscPort Pro and the DiscPort

Tower networked CD-ROM systems give you the freedom to set up your CD servers anywhere on the network while letting PC users connect to CD-ROMs using familiar NetWare commands. The bundled software, DiscView Pro, earned high Suitability to Task ratings but is not sold separately.

The DiscPort Pro (\$1,595), about the size and shape of a cigar box, comes with an Ethernet adapter and two SCSI-2

adapters to connect up to 14 CD drives. The DiscPort Tower (\$3,195) includes 4 quad-speed Sony CD drives—expandable to 7 or 14 drives—and either an Ethernet or Token-Ring network adapter. On our tests the DiscPort Pro (with Meridian's CD NET ROM tower) performed well, outpacing the DiscPort Tower.

Both DiscPort systems work with NetWare 3.x and 4.x servers in Bindery emulation and require no client software beyond a NetWare client. As with Novell's CDROM.NLM and other NLM solutions, the CD-ROM drives can be mapped just like any other NetWare server volume. And because the DiscPort hardware does not need to be attached to the server you can easily install the software.

Once connected to the network, you configure the DiscPorts using DiscView Pro, a Windows-based management and monitoring application. DiscView Pro runs from any networked PC and lets you perform configuration basics such as naming the DiscPort host and then attaching DiscPort servers to specific NetWare servers. Though you can connect only one DiscPort per server, you can attach up to 14 drives to DiscPort Pro. DiscView also lets you choose specific device drivers for CD-ROM drives from various manufacturers. The current version of DiscView does not support jukeboxes, but a new version will. It should be available by the time you read this.

When you install the DiscPort hardware with DiscView, the software automatically copies and loads the DiscPort NLMs to the NetWare file server you designate, so you don't have to install the NLMs manually from the NetWare server console.

Managing CDs with DiscView is as easy as the installation. Graphical views of the DiscPort system let you manage multiple DiscPorts simultaneously. The Map view shows NetWare servers, DiscPort hosts, and individual CD drives. An alternative File Manager-like interface lets you perform similar functions. In either

view, you can double-click on any drive to eject, lock, or mount CDs.

Mounting DiscPort drives makes them available to the NetWare server. The DiscPort NLM then automatically mounts the drives as NetWare volumes, and Windows and DOS NetWare clients can map these volumes as if they were regular NetWare file server volumes. DiscPort also supports Macintoshes connected to NetWare file servers through NetWare Mac namespace volumes and can recognize the popular Mac HFS CD Support format.

While DiscPort cannot group multiple drives under one drive letter, users can run SmartLaunch, a batch program for Windows that automatically maps drives, launches programs, and deletes the mapped drives when it terminates. The batches are centrally administered by the DiscPort manager. But the utility, available only to Windows users, is a little slow; the SmartLaunch application must launch each time to load the batch file.

If you like the DiscPort and have a NetWare 4.x server but don't want to buy Microtest's hardware, consider the CD-Now! (\$1,495; 50-user license). CD-Now! includes an NLM and NetWare 4.1 in 50-through 1,000-user versions. Because CD-Now! doesn't run on NetWare 3.x, we did not include it in our review.—TP

DiscPort Pro. List price: \$1,595. **DiscPort Tower.** List price: \$3,195. Microtest Inc., 4747 N. 22 St., Phoenix, AZ 85016; 800-526-9675, 602-952-6400; fax, 602-952-6401; e-mail, 70414.774@compuserve.com.

Circle 470 on reader service card

SUITABILITY TO TASK

SCSI Express for NetWare

Setup and installation	Good
Administration and management	Fair
Scalability	Good
Client access	Fair

SUITABILITY TO TASK

DiscView Pro

Setup and installation	Excellent
Administration and management	Excellent
Scalability	Good
Client access	Excellent



The DiscPort Pro (\$1,595) comes with an Ethernet connection and two SCSI-2 adapters to connect up to 14 CD drives.



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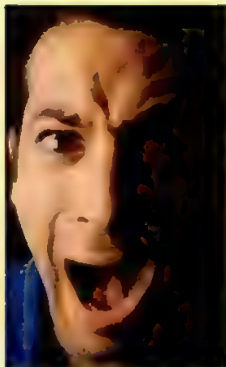
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Ornetix Network Products

CD-Vision, CD-Commander

CD-Vision, a software-only CD-ROM server solution, is easy to install and, when combined with the optional CD-Commander, offers extensive control over shared CD-ROMs. CD-Vision (\$795 for ten users) turns any DOS-based machine into a CD server by emulating a NetWare 3.x server. CD-Commander (\$945 bundled with CD-Vision, \$295 separately) adds good management features and an excellent Windows client for accessing networked CDs.

CD-Vision may be the only software that you need for sharing CDs. CD-ROM drives connected to any DOS PC running CD-Vision will appear as NetWare volumes, ready to be shared. NetWare users will enjoy the familiarity of commands such as login, logout, attach, and map; as with other NetWare-based products in this roundup, no additional software is required for simple CD sharing.

Independent of your NetWare license, CD-Vision can support up to 250 simultaneous users. Given the program's capacity to serve up to 196 SCSI CD-ROM drives, you'll appreciate its ability to create virtual volumes that contain multiple CD-ROM drives, so that they appear as subdirectories under one drive letter. Other features on the CD-Vision server include automatic load balancing, read-ahead caching, and administrator-controlled disk-eject for extra security. The load-balancing feature worked well in testing: When identical disks are inserted into the

server, one is labeled master and the other is a slave, and CD-Vision seamlessly switches between them based on client requests.

For clients that don't have MSCDEX installed, Ornetix also provides OCDX, which emulates MSCDEX for applications that require it. Clients that have MSCDEX already installed can access a CDs without any additional software.

CD-Vision was easy to install and configure. Using its own Advanced SCSI Programming Interface (ASPI) drivers,

CD-Vision supports most CD-ROM drives, as well as IDE drives and magneto-optical and WORM drives.

Administrators manage CD-Vision server access through NetWare's Syscon utility, just as if it were a NetWare 3.x server. You can create users and groups, but you cannot use trustee rights. This means that administrators cannot create access limitations for individual volumes—you grant either complete access to CD-Vision or none. CD-Vision works with NetWare 3.x and 4.x servers in Bindery emulation only. The text-based CD-Vision server console provides detailed information about the CD-ROM volumes, user information, cache size, number of reads and hits, and hit percentages.

CD-Commander, which works only with CD-Vision, makes the Herculean task of managing several CD applications much easier. It consists of a Windows application that lets you manage CD titles for individual users or groups, and client software that appears as a

floating toolbar with icons for any networked CD-ROM drives. In addition to the toolbar, users can create program items for Windows' Program Manager from CD-Commander software titles.

CD-Commander's administrator module, which you can use from any network client, allows you to change software titles on the network from a central

location. It lets you see which titles are in which drives, and CD-Commander's title-metering feature can limit the number of users concurrently accessing each licensed application.—CL

CD-Vision. List price: \$795. **CD-Commander.** List price: \$295. Ornetix Network Products Inc., 1885 Lundy Ave., San Jose, CA 95131; 800-965-6650; Web, <http://www.ornetix.co>.

Circle 471 on reader service card

SciNet Inc.

CD-Manager, CD-System

The effortless installation of CD-Manager software, which emulates a NetWare file server, is even easier when you buy it preinstalled on SciNet's CD-System tower—you just plug it in and turn it on. But the system's performance was below average, and its management features were inadequate.

CD-Manager 2.2 (\$495 for a five-user license) will transform any 386-based or better DOS PC into a NetWare-compatible server, making any of its local resources available to NetWare users. We were impressed with the simple elegance of its design but were disappointed with the lack of administrative tools necessary for a larger environment.

We tested SciNet's CD-System (\$4,995), a midsize tower that runs CD-Manager. It sits independently on the LAN and includes seven Sanyo quad-speed CD-ROM drives. We plugged in the power cable and Ethernet connector and the server was ready to go. Both the operating system and the CD-Manager software reside on a flash disk in the system. The hardware includes both UTP and STP Ethernet connectors and a second SCSI-2 controller for attaching up to seven more external drives.

Acting essentially as a bridge between DOS and NetWare, CD-Manager makes any CD-ROM drive mounted by MSCDEX appear as a NetWare volume. It can also do the same for IDE drives and other devices accessible in DOS. But our review unit could support only 24 drives because of the drive-letter limitations of DOS.

SUITABILITY TO TASK

CD-Vision with CD-Commander

Setup and installation	Good
Administration and management	Good
Scalability	Excellent
Client access	Good

SUITABILITY TO TASK

CD-Manager

Setup and installation	Good
Administration and management	Fair
Scalability	Fair
Client access	Fair



From the CD-Vision server console, you can configure multiple CD drives under one virtual NetWare volume.

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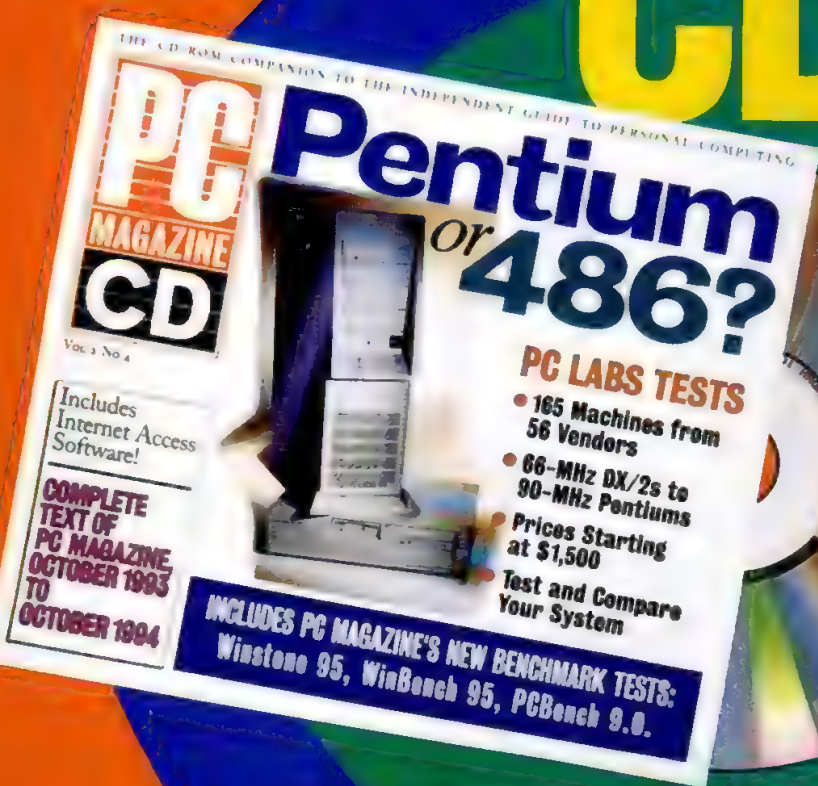


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Success is the sum of small steps, taken every day. -Nelson Mandela



Plug in SciNet's CD-System (\$4,995) and it's ready to go. Configurability, though, is limited.

By the time you read this, CD-Manager 3.0 should be available, which adds a virtual drive-mapping feature called Flexible Volume Grouping. The new version should improve security features and provide a new server management console.

After the quick and easy installation, up to 250 simultaneous users can attach and map the CD-ROM volumes to their workstations. You can set CD-Manager to use as much as 100MB of RAM (if you have it on your server) as the CD-ROM cache.

As with any NetWare 3.x server, you can create users and assign access rights to CD-ROM volumes by using Novell's Syscon utility. Support for NetWare Directory Service (NDS) will be available in a future release.

You can manage the SciNet server via a local console using Syscon or remotely via Funk Software's Proxy (included with CD-Manager). Proxy works through any Windows client on the network.

We were disappointed with the absence of features such as load balancing and application metering in CD-Manager. Much of the configuration can be changed only by editing a file with a text editor, and no utilities were provided to ease client access or manage users.

SciNet promises to address some of these shortcomings in its next version of CD-Manager.—CL

CD-Manager 2.2. List price: \$495 (five-user license). **CD-System.** List price: \$4,995. SciNet Inc., 3255-2 Scott Blvd., #102, Santa Clara, CA 95054; 800-653-1010, 408-492-9365; fax, 408-492-9379; e-mail, 75332.2465@compuserve.com.

Circle 472 on reader service card

Stac Electronics

CD-QuickShare

Stac Electronics has applied its compression art to CD-ROM sharing, but the results are not auspicious. CD-QuickShare (\$745) is a speedy, hard disk-based peer-to-peer solution that needs no dedicated CD-ROM drives or file server and can be set up on virtually any network without difficulty, despite making you install software on each client PC. If you already have large amounts of free hard disk space on your network, the solution could be relatively inexpensive.

But CD-QuickShare has its problems. Copying each CD title is onerous. It took us an average of 45 minutes per disk with compression, using our double-speed CD-ROM drive—compared with just popping a CD into a shared drive. Spending hours updating CDs each month, as you would with CD subscriptions, could be a nuisance. Furthermore, because many titles are already compressed, Stac's compression provides no benefit for some CDs.

CD-QuickShare compresses an image of a CD-ROM on your server's hard disk. Because the product works as a peer-to-peer server, virtually any server can be the CD-QuickShare server, including servers running NetWare and Windows NT. CD-QuickShare consists of two software pieces: CD-Administrator copies a single-file image of the CD to a shared hard disk and helps you manage your CDs; CD-Selector client software lets you access the titles.

SUITABILITY TO TASK

CD-QuickShare

Setup and installation	Fair
Administration and management	Fair
Scalability	Good
Client access	Fair

CD-Selector makes the CD image created by CD-Administrator look like a regular CD. A user selects the CD from a list of available images and "inserts" the CD into the CD-QuickShare CD "drive." Once selected, the title is available to

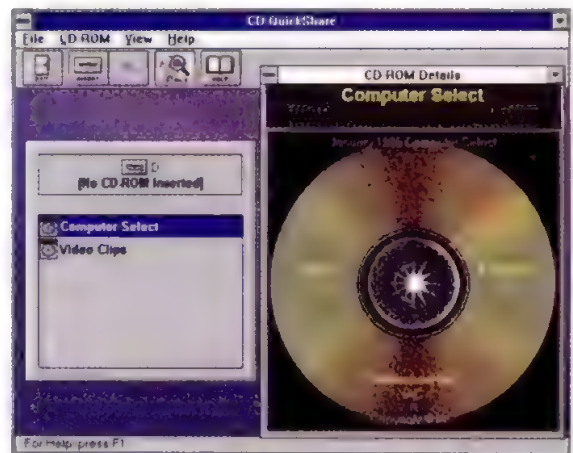
the client through the drive letter designated for CD-QuickShare.

CD-QuickShare earned a place as one of the faster products in our review group. It did well on our Multimedia Video and Database Search tests and performed well when multiple clients accessed the same CD data. It was outpaced, however, by JVC's CD Library Manager and Micro Design's SCSI Express.

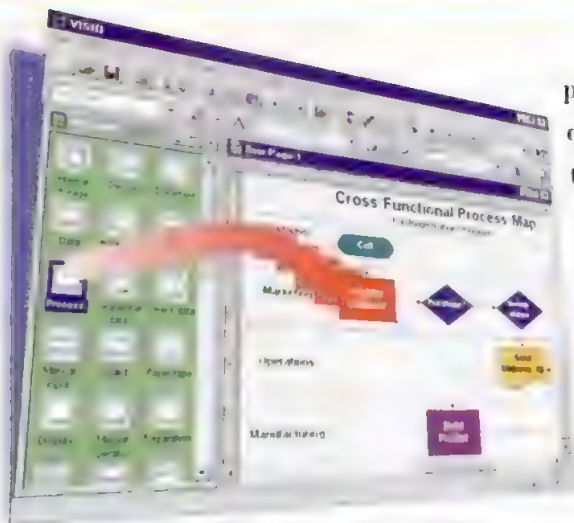
On our tests, accessing CD data from the hard disk did not take place as fast as we expected. One reason is that for CD-QuickShare, we had multiple clients accessing a single hard disk versus four separate CD-ROM drives for all the other products in this roundup.

Plan on spending some time installing a few more hard disks to meet the space demands for CD-QuickShare. And although Stac has done a good job of automating the installation of the CD-Selector software, you still have to spend time to set it up on each workstation. All in all, we'd rather have a CD-ROM drive.—TP
CD-QuickShare. List price: \$745. Stac Electronics., 12636 High Bluff Dr., San Diego, CA 92130-2093; 800-522-7822, 619-794-4300; fax, 619-794-3717; e-mail, info@stac.com; Web, <http://www.stac.com>.

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CD-QuickShare's CD-ROM drive metaphor lets users "insert" available CDs into the predesignated CD-QuickShare "drive."



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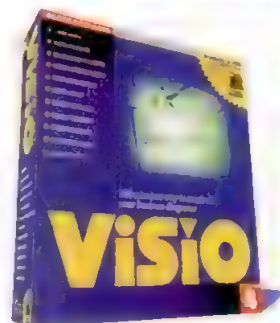
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Architected for Client/Server Application Development	Yes	No	No

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CIRCLE 345 ON READER SERVICE CARD

Networked CD-ROMs

TAC Systems Inc.

SCSI Shuttle for NetWare, HotSwap MiniTower

Despite the good performance and scalability of this NLM-based solution, SCSI Shuttle for NetWare 4.0 does not have a lot to offer as far as management or client-access features. It comes in two versions: SCSI Shuttle for NetWare (\$1,295), with support for unlimited drives but a NetWare limitation of 63 CD-ROM volumes, and SCSI Shuttle Lite for NetWare (\$695), which supports a maximum of 7 CD drives but is otherwise identical.

SCSI Shuttle includes server and configuration NLMs and drivers. TAC Systems also sells the HotSwap MiniTower (\$1,200), which comes with SCSI Shuttle preinstalled and 7 CD drive bays. Also available are the HotSwap Tower (\$2,400) with 16 drive bays and the TwinTower (\$4,800) with 32 drive bays. For a complete solution, you can also purchase from TAC a SCSI adapter (\$425) and hot-swappable quad-speed Sony CDU76S CD-ROM drives for \$450 each.

We tested SCSI Shuttle with the HotSwap MiniTower and four drives, bringing our configuration to \$5,320. With the HotSwap MiniTower configuration, SCSI Shuttle was the best performer on our Multimedia Video test but slipped to average on Database Search.

Because you mount CDs as NetWare volumes, you don't need client software to access the CDs. SCSI Shuttle can share disks with most NetWare clients, including DOS, Windows, Windows 95, and Macintosh clients. SCSI Shuttle does not limit the number of NetWare users who can access the system.

Our installation was not effortless. Although the installation program had a help menu, when we selected it, no on-line help could be found. However, SCSI Shuttle does include hard-copy documentation, and we found that TAC Systems' technical support was excellent.

We also had difficulty with the copy-protection access code that SCSI Shuttle requires to install properly. If you are using SCSI Shuttle for more than two CD-ROM drives, you must enter an access code that is created from the software ser-

ial numbers of SCSI Shuttle and the copy of NetWare you're using. The correct access code must be obtained by contacting TAC Systems by telephone or fax.

To configure and administer SCSI Shuttle, you use the text-based menu interface of the TACCFG NLM. In this regard, SCSI Shuttle is only somewhat better than Novell's NLM, which provides a command line interface and requires the administrator to use server-console commands. Also unlike Novell's NLM, TACCFG lets the administrator modify the volume names of the CD-ROMs. However, the product's management features did not extend much beyond the basics.

SCSI Shuttle allows multiple CD-ROM drives to be configured as one NetWare volume, with each drive mapped as a subdirectory in that volume. This strategy is useful when you have multiple CDs pertaining to a common topic. It also reduces the number of NetWare drive mappings used for CDs.

The initial mount times of CDs were short (30 to 40 seconds); subsequent mounts were instantaneous. However, when we brought the server down and restarted it, all the configured CD-ROMs were on-line, but the ownership and volume name information was lost from the TACCFG menus. TAC Systems claims that you can get this information back by typing "Mount All" at the user prompt after rebooting.—ARD

SCSI Shuttle for NetWare 4.0.
List price: \$1,295.
HotSwap MiniTower. List price:

SUITABILITY TO TASK

SCSI Shuttle for NetWare

Set-up and installation	Poor
Administration and management	Fair
Scalability	Good
Client access	Fair



TAC Systems sells the HotSwap MiniTower enclosure for \$1,200 and hot-swappable, quad-speed Sony CD drives for \$600 each.

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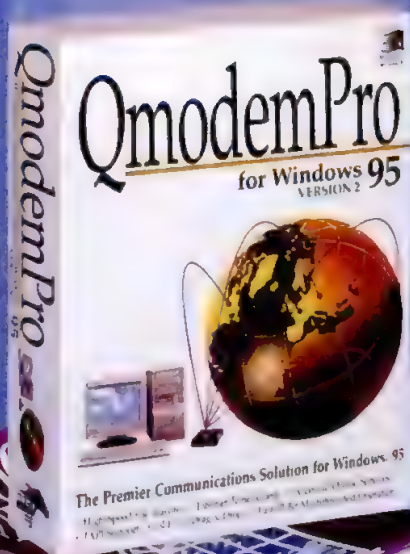


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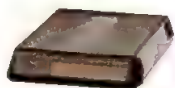
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CIRCLE 058 ON READER SERVICE CARD

PC Tech

THE DEFINITIVE GUIDE TO PC TECHNOLOGIES & TOOLS

Fresh Takes on RAD

Visual Basic 4.0 and Oracle Power Objects offer distinct new angles on rapid application development.

By Thomas Mace, Jay Munro, and Stephen W. Plain

The client/server tools market is a battleground, but one that offers plenty of room for new combatants. To help you size up the competition, we take a look at two significant new entrants, Microsoft Visual Basic 4.0 Enterprise Edition and Oracle Power Objects. Both deserve consideration if you're serious about database development.

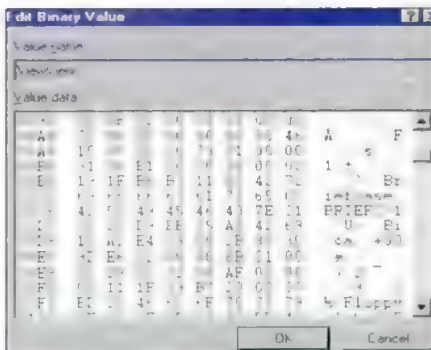
Visual Basic 4.0 is an upgrade to a mature product, while Power Objects is a first release. Both are targeted at Basic programmers and have a number of comparable features, including their visual programming paradigms, remote data-access capabilities, and support for OLE custom controls (OCXs). Both products generate executables that rely on a runtime language engine. Yet they take very different approaches to client/server development and offer quite different strengths and weaknesses.

Visual Basic 4.0, now a 32-bit development system, offers considerable advances over previous releases in the areas of data access and code reuse. Its integration of OLE into almost every corner of the product, from the new OCX control format to user-

IN THIS SECTION



TUTOR There's no industry like the computer industry when it comes to generating acronyms and abbreviations. Not sure how the DCI component works in conjunction with the GDI and whether it has been supplanted by DDI? To help you know your EDO RAM from your ISDN, Jeff Prosis offers a guide to the wilderness of PC acronyms. *page 259*



The Registry doesn't have to be a scary place.



INSIDE WINDOWS 95 We conclude a three-part look inside the Windows 95 Registry with a collection of techniques for using it to customize the Windows 95 shell. Close-to-the-metal Registry editing lets you do everything from manipulating hardwired icons like My Computer and Recycle Bin to launching programs at start-up. *page 271*



INSIDE OS/2 In the last of our three-part series on IBM's SOM, we take a practical turn and show you how to use REXX to create SOM objects in OS/2 Warp's Workplace Shell. Code examples let you create a customized LaunchPad, a boon for administrators who may have to set up scores of systems. *page 279*

ALSO IN THIS ISSUE We explore a PC Magazine reader's revolutionary new use of DOS's CHOICE command, describe how multiple joysticks can connect to the same game port, look at upgrades using Intel's Overdrive processor, and provide examples of Access functions that close the program and Windows itself with a single button click. *page 295*

NEW CONTENTERS: Microsoft Visual Basic 4.0 Enterprise Edition and Oracle Power Objects offer different twists on the visual programming paradigm. VB is a flexible, general-purpose tool with substantial database connectivity. Power Objects is a dedicated client/server tool that leverages knowledge of the underlying database.

Oracle Power Objects
Client/Server Edition



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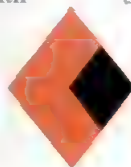


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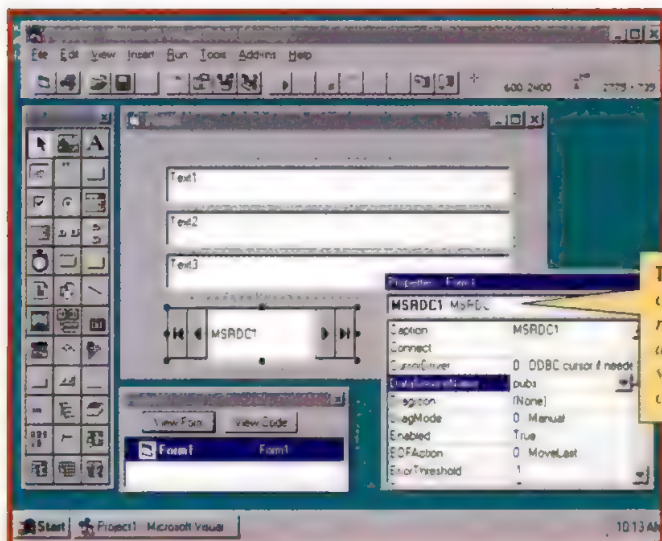


FIGURE 1: VB's new remote data control.

created OLE objects, gives developers a host of intriguing new possibilities, some of which will recommend themselves for enterprise-level development. At the same time, Visual Basic's legacy as a general-purpose programming tool is apparent in the fact that many database-specific tasks—building elaborate data-entry forms, for example—still involve a lot of tedious work.

A latecomer to the tools arena, Power Objects has the luxury of taking a fresh look at the database developer's problems. Its combination of practical object orientation, drag-and-drop development tools, and use of intrinsic knowledge of the underlying database offers a fresh and powerful solution. Its weaknesses—a limited code editor, a quirky approach to variable scope, and a bare-bones report writer—are attributable to its newness. An updated 32-bit release is scheduled for the first quarter of 1996.

Microsoft Corp.

Microsoft Visual Basic 4.0 Enterprise Edition

Visual Basic started life as a visionary way for mere mortals to build event-driven Windows programs. It became wildly successful as a database and client/server tool, so Microsoft added many specialized data-access features, but never transformed it into a database-only affair. An important and long-awaited new release, Microsoft Visual Basic 4.0 Enterprise Edition continues this line of development.

VB is now a fully 32-bit tool for building Windows 95 and Windows NT applications. With its greatly improved remote data access and significant new OLE-based object technologies, VB's support for database applications has never been stronger. At the same

time, it lacks the single-minded focus and some of the bells and whistles of rivals that focus solely on database development.

We looked at the Enterprise Edition (\$999), which is target-

THE REMOTE DATA CONTROL
connects directly to remote ODBC databases and provides a data source for data-aware controls.

ed at teams of professional client/server developers. Version 4.0 also ships in a Professional Edition (\$499), for developing stand-

alone databases and general-purpose apps, and a Standard Edition (\$99). The Enterprise and Professional editions both continue to support 16-bit development.

NEW JET

VB's Jet database engine has always been a key component for local and remote data access. While past Jet versions have been decidedly underpowered, VB now ships with the same 32-bit Jet 3.0 database engine included with Microsoft Access 95 (Jet 2.5 is also included to support 16-bit development).

Jet 3.0 provides many powerful new features, including engine-level referential integrity with support for cascading updates and deletes, field- and record-level data validation, primary-key enforcement, tunable caching of remote data sources, and password-based security. It also has built-in replication support, which will be of special interest for developers of mobile applications.

An enhanced Data Control offers a fast, straightforward way to give your application basic record-navigation, edit, and update functions (add and delete require coding). You can use it to access any database that is accessible through Jet, including Btrieve, FoxPro, dBASE, and Excel. As in Version 3.0, you can bind data-aware controls to the Data Control through their DataSource and DataField properties. The once-scanty set of data-aware controls has been beefed up considerably by the addition of a data-aware grid, list box, combo box, and OLE control.

Jet continues to provide Data Access Ob-

jects (DAOs), whose methods and properties give you the programmatic means to create, navigate, and manipulate databases. The only significant change here is the new Recordset object, which offers table, Dynaset, and Snapshot properties and more powerful methods for positioning the record pointer.

REMOTE DATA THROUGH ODBC

ODBC remains one of the most important ways of accessing client/server data. Your applications can access ODBC data sources directly through the Jet engine and DAOs, or you can bypass Jet and use the new Remote Data control and Remote Data Objects (RDOs). Using Jet to handle syntax and data manipulation is the simplest approach, but the Remote Data control (essentially a VB wrapper to ODBC) and RDOs can offer better performance and a smaller application footprint. They also give you control over server-side cursors (including the type of cursor) and let you set pessimistic or optimistic update concurrency.

The Remote Data control and Remote Data Objects act very much like the local Data Control and Data Access Objects (see Figure 1). The Remote Data control provides basic record navigation and can be the data source for any of the data-aware controls like the grid or list box. For applications designed to work with Microsoft SQL Server, VB also provides a VB-specific DB-Library implementation. As in VB 3.0, you also have the option of coding directly to the ODBC API.

OLE AUTOMATION OBJECTS

VB 4.0 now lets you write reusable compiled-code modules called *OLE automation objects*. This represents a major advance over earlier

VB versions, where code reuse was always a primitive cut-and-paste affair. OLE automation objects are similar in concept to DLLs, except that the variables and storage of each instance of a class are protected from other instances. Unlike traditional DLLs, which are compiled machine code, VB's OLE automation objects (and all other VB executables) consist of p-code that is interpreted at runtime.

OLE automation objects are created by building Class Modules, which join code modules and form modules as a third standard type of VB source code object. OLE automation objects expose methods and properties defined in your class-module code through an OLE 2.0 automation interface. These can be called by your current VB application, other VB applications, and other

Class Modules now join code modules and form modules as the third standard type of VB source code object.

Visual Database Programming

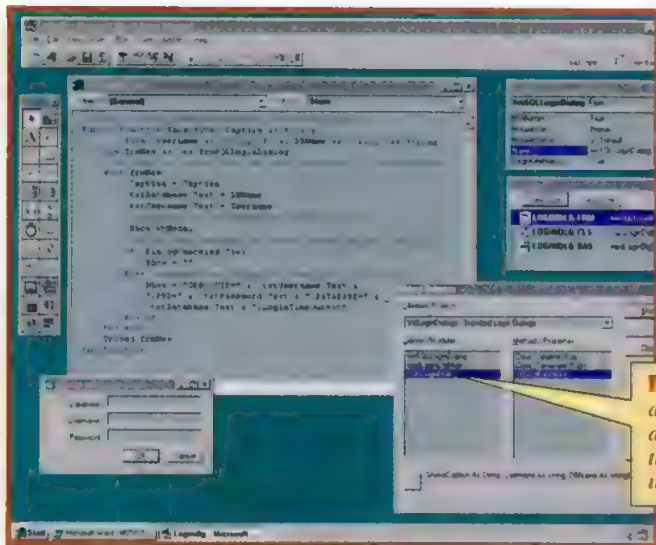


FIGURE 2: Editing a class module.

OLE-enabled applications.

OLE objects that execute within an application's address space are called *in-process servers*. These are compiled with a .DLL extension. VB also supports the creation of out-of-process servers, compiled as .EXEs. These use an OLE proxy/stub mechanism to pass data between process boundaries (between your object and Microsoft Excel, for example). Communication between clients and out-of-process servers entails significantly more overhead than in-process communication. The advantage of an out-of-process server is that many OLE clients can use its services; with an in-process server, each OLE client needs its own copy.

REMOTE AUTOMATION SERVERS

By far the most interesting new feature in VB 4.0 is the ability of out-of-process servers and OLE clients to interact across a network. This feature, called *remote automation*, amounts to a form of distributed OLE, similar in concept to the operating system-based distributed OLE promised for the next major upgrade of Windows NT (code-name Cairo). The standard OLE proxy/stub mechanism is replaced by one that uses remote procedure calls (RPCs) across the network.

Remote automation raises the possibility of building partitioned or *multitier* client/server applications. The most common multitier scenario is a three-tier design, where three discrete systems are used for client application logic, business rules (tax calculations or order processing routines, for ex-

ample), and the database server.

Multitier client/server application is a hotly debated topic, a client/server nirvana for some and anathema to others, who feel that business rules belong on the database server as stored procedures or triggers. If you're sold on multitier

THE NEW OBJECT BROWSER displays the names and documents the functionality of all the objects in your project.

er designs, remote OLE automation offers intriguing possibilities. It also raises some performance concerns because of network latency, RPC overhead, and the fact that the remote servers are interpreted. Although we did not run formal benchmark tests, remote OLE automation objects do not appear to be a good vehicle for performance-critical code. At the same time, they offer an excellent way to get business logic out of the user application and keep it in a centralized place where it can be easily maintained and updated.

The introduction of OLE automation objects gives VB a toehold in the world of object orientation. At the same time, VB is far from being a true object-oriented tool. You still cannot derive new classes from existing VB classes, and you can't base your classes on existing VB objects such as forms.

THE DEVELOPMENT ENVIRONMENT

The look and feel of the VB 4.0 development environment is generally unchanged. Controls are still clustered together on a single palette, although the addition of ToolTips and right-mouse-button support has certainly made navigation easier. VB still lacks a lot of the special tools database programmers need for repetitive tasks, however, such as building forms with large numbers of text controls.

The Visual Basic language has been brought into conformity with

32-BIT OCX REPLACEMENTS for all the VBX controls shipped in earlier versions make basic code migration straightforward.

Visual Basic for Applications syntax. This gives it some useful new elements such as the line-continuation

character (underscore) and the With statement. New #If and #EndIf statements let you embed conditional blocks in your code for supporting multiple targets. Support for resource files now makes it easier to create localized versions of your application. For development teams, VB 4.0 includes the easy-to-use Microsoft SourceSafe version-control package.

VB 4.0 introduces the new OLE-based 32-bit OCX control format. VBX controls are still supported, but only for 16-bit projects. VB includes an OCX replacement for all the original VBX controls. If your projects use only these controls, migrating existing source code to VB 4.0 is transparent; the environment simply prompts you to replace the old controls with new ones. If you used third-party controls, you must get OCX equivalents from the vendor. You must also update any API calls in your source code to the Windows 95 or Windows NT APIs.

More than ever, Visual Basic is a powerful if somewhat unusual tool for building database applications. Its new Jet engine, Remote Data control, and RDOs are a vast improvement over the previous release. OLE automation, Version 4.0's most significant breakthrough, provides a real strategy for code reuse and the first gleam of object orientation. The possibilities of remote OLE automation are intriguing and well worth exploring.

Microsoft Visual Basic 4.0 Enterprise Edition. List price: \$999. Microsoft Corp., Redmond, WA; 800-426-9400.

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Oracle Corp.

Oracle Power Objects

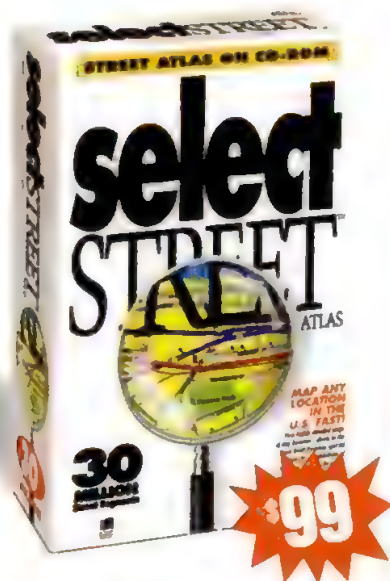
An ideal front-end development tool needs to be more than merely visual and data-aware: It must leverage GUI design techniques and apply intrinsic knowledge of the underlying database to help you perform common development tasks quickly and efficiently.

Oracle Power Objects aims to deliver just that. Targeted at workgroup application development, Power Objects uses two powerful techniques to streamline front-end development: a practical object-oriented approach that sidesteps the intricacies of traditional object-oriented programming and drag-and-drop visual application design. While these two fundamentals provide an excellent foundation on which to build a development tool, the initial release of Power Objects has a couple of rough edges.

Power Objects is currently available for Microsoft Windows 3.1 and Macintosh in two editions: a \$395 Standalone Edition and a \$1,995 Client/Server Edition. Both versions are functionally identical and differ only in their database connectivity. The Standalone Edition comes with Oracle's Blaze local database as



FIGURE 3



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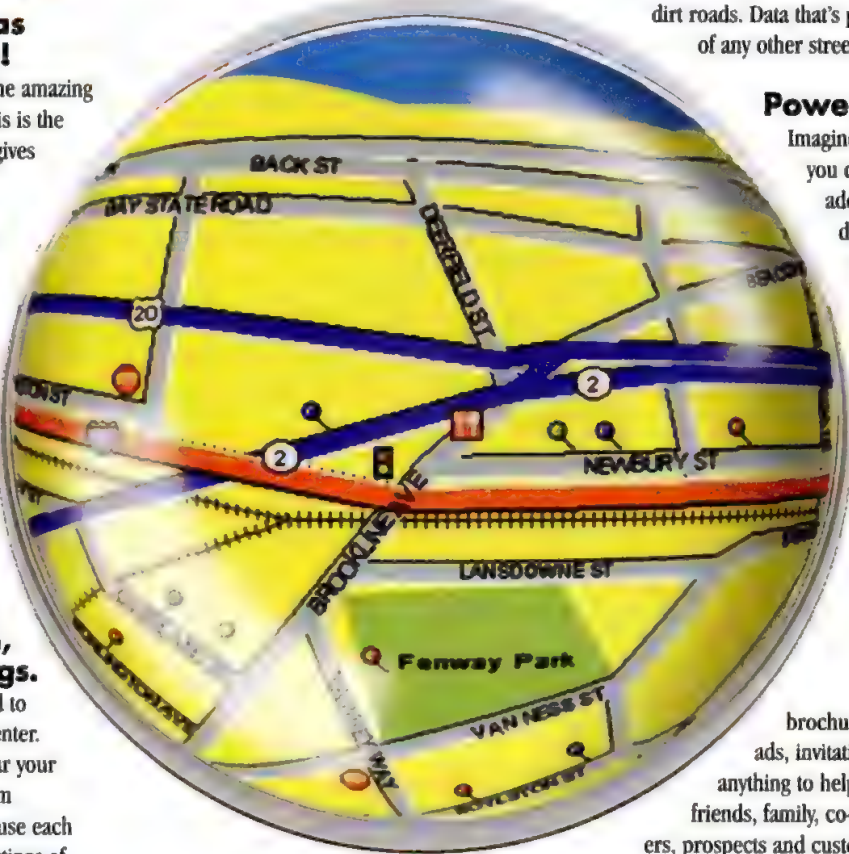


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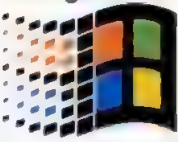
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well as support for Personal Oracle7. The Client/Server Edition adds support for Oracle7, Microsoft SQL Server and Sybase SQL Server. Oracle has announced plans for OS/2 and Windows 95 versions, but the 16-bit Windows version is the only current choice on the PC.

DEDICATED TO DATABASES

Power Objects resembles Visual Basic in many ways. As in VB, development revolves around building forms, placing controls, and setting properties. Power Objects uses Oracle Basic—a Basic dialect that closely parallels VB—for writing methods. It also provides an integrated interface for working with database tables, indexes, and views for the connected server. But, while VB is a general-purpose tool with database capability, Power Objects focuses solely on database development.

One of the most striking features of Power Objects is the integration of drag-and-drop into all aspects of development. While its implementation in this first release is less than perfect, this approach greatly simplifies many tasks.

The Power Objects interface is straightforward and uncluttered. The Main window contains all the highest-level objects: applications, libraries, and database sessions (see Figure 4). Each of these three basic object types opens to show you its component objects. For example, a database session object typically con-

tains tables, indexes, and views, while an application object contains forms, reports, and bitmapped graphic objects. You can drag-and-drop objects between applications and between database sessions, even those based on different databases.

FIRST STEPS

The first step to developing a Power Objects application is building a database session. Power Objects uses a standard interface for all supported databases, though some server-specific features may not be available on all servers. The Blaze database included in the product is basically a subset of Personal Oracle7, the company's local version of Oracle7 Server. Blaze stores all of a database's objects in a single file with a .BLZ extension. While Blaze is a SQL database, it is primarily designed for single-user applications. It does not support some of the key aspects of Personal Oracle7, such as mul-

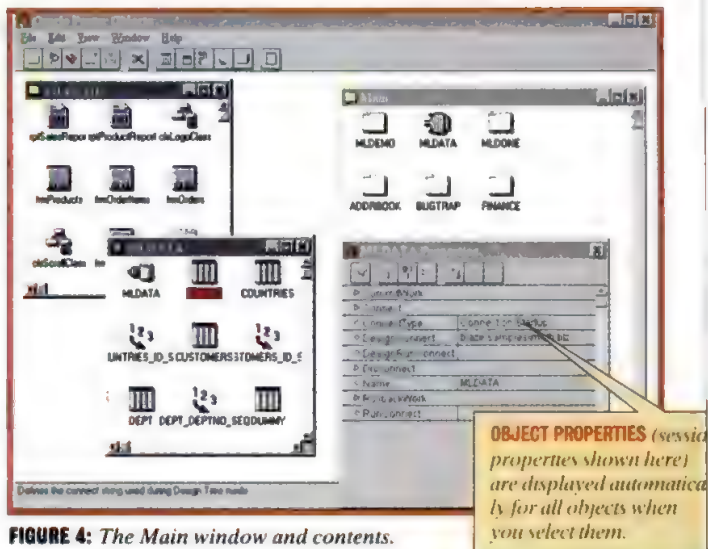


FIGURE 4: *The Main window and contents.*

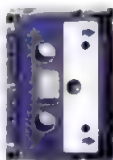
multiple-column primary keys and PL/SQL. If you're developing applications for deployment on Oracle Server, you'll definitely want to use Personal Oracle7, as its feature set is identical to the larger server product.

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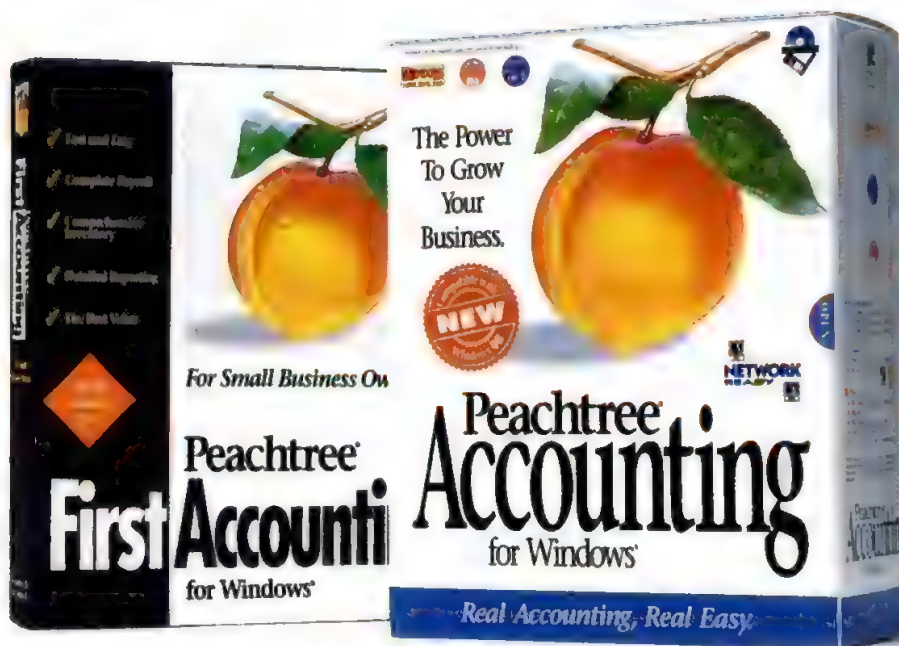
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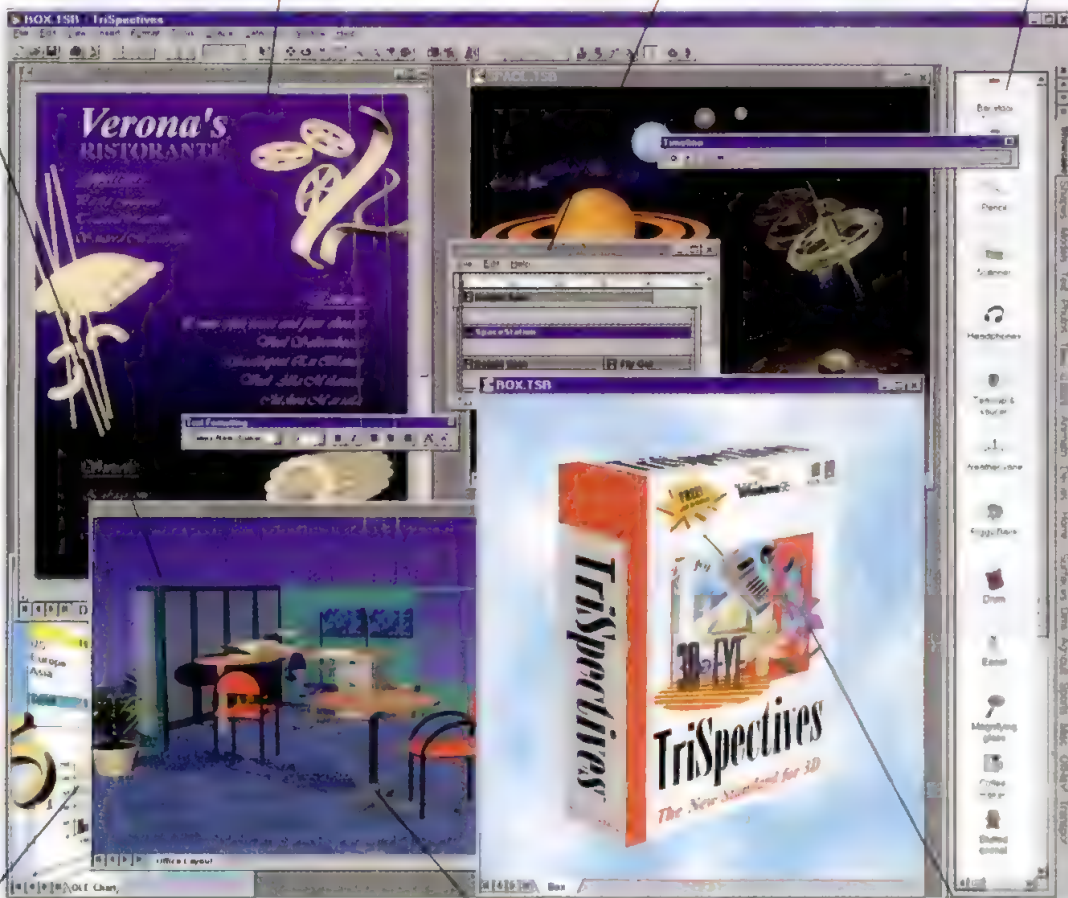
Stanford Dziel, BYTE Magazine, October 1995

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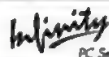
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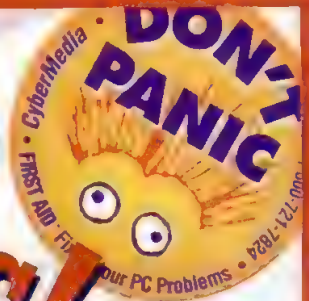
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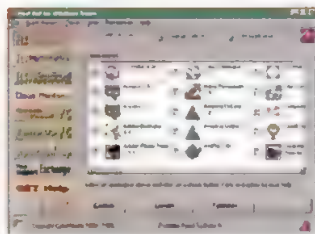
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CIRCLE 231 ON READER SERVICE CARD



By Jeff Prosis

Everyone's Guide to Computer Acronyms

Here's a handle on the computer industry's proliferation of abbreviation.

Most of us know what RAM and MB stand for, but what about MPEG, PCMCIA, and ODBC? How many computer users do you know who could expand these acronyms into words, much less explain to a lay person what they mean?

For those of you who don't know every computer acronym by heart, this issue's Tutor column presents a list of commonly used acronyms that every computer user should be familiar with, complete with concise definitions. We've included pronunciations in cases where an acronym is pronounced as a word rather than letter by letter (JPEG, for example, which is usually pronounced "jay-peg" rather than "J-P-E-G"). Even after I culled the acronyms that I and other *PC Magazine* editors considered "essential," it was still too long to print in one issue. Therefore, this column contains acronyms that begin with the letters A through N. The next Tutor column will follow up with O through Z.

API (application programming interface) A set of subroutines or functions that a program, or *application*, can call to tell the operating system to perform some task. The Windows API consists of more than 1,000 functions that programs written in C, C++, Pascal, and other languages can call to create windows, open files, and perform other essential tasks. An application that wants to display an on-screen message can call Windows' *MessageBox* API function, for example.

ASCII (American Standard Code for Information Interchange) Pronounced "ass-kee." A standard developed by the American National Standards Institute (ANSI) describing how characters can be represented on a computer. The ASCII character set consists of 128 characters numbered from 0 to 127 and includes numerals, punctuation symbols, letters, and special control codes such as end-of-line characters. The letter A, for example, is represented by the number 65. Most personal com-

puters use some form of the ASCII character set. (One exception: computers running Windows NT, which uses the newer and more expansive Unicode character set.)

ASIC (application-specific integrated circuit) An integrated-circuit chip designed for a particular use rather than general use. Many video boards and modems use ASICs.

ATA (AT attachment) The specification, formulated in the 1980s by a consortium of hardware and software manufacturers, that de-

BIOS (Basic Input/Output System) Pronounced "by-oss." A set of low-level routines in a computer's ROM that application programs (and operating systems) can use to read characters from the keyboard, output characters to printers, and interact with the hardware in other ways. Many plug-in adapters include their own BIOS modules that work in conjunction with the BIOS on the system board.

CISC (complex instruction-set computing) Pronounced "sisk." A microprocessor architecture that favors robustness of the instruction set over the speed with which individual instructions are executed. The Intel 486 and Pentium are both examples of CISC microprocessors. (See the Tutor column of October 24, 1995.) See also *RISC*.

CMOS RAM (complementary metal-oxide semiconductor random access memory) A bank of memory that stores a PC's permanent configuration information, including type identifiers for the drives installed in the PC and the amount of RAM present.

CPU (central processing unit) A formal term for the microprocessor chip that powers a personal computer. The Intel Pentium chip is one example of a CPU. The term sometimes also refers to the case that houses this chip. See also *FPU*.

CRC (cyclical redundancy check) A mathematical method that permits errors in long runs of data to

be detected with a very high degree of accuracy. Before data is transmitted over a phone, for example, the sender can compute a 32-bit CRC value from the data's contents. If the receiver computes a different CRC value, then the data was corrupted during transmission. Matching CRC values confirm with near certainty that the data was transmitted intact.

CRT (cathode-ray tube) The tube of a television or monitor in which rays of electrons are beamed onto a phosphorescent screen to produce images. Often used as a generic term for a computer monitor.

DCI (display control interface) A component of Windows that works in conjunction with the



fines the IDE drive interface. AT refers to the IBM PC/AT personal computer and its bus architecture. IDE drives are sometimes referred to as ATA drives or *AT bus* drives. The newer ATA-2 specification defines the EIDE interface, which improves upon the IDE standard. See also *IDE* and *EIDE*.

BBS (bulletin board system) A term for dial-up on-line systems from which users can download software, leave messages for other users, and exchange information. BBSes proliferated in the 1980s with the advent of inexpensive PCs and modems. Today, more than 65,000 are estimated to be operating in the United States alone.

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walk hard

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clock on a Sunday afternoon and you're finally crossing the last item off weekend's "to-do" list. Time to get physical, but the gym or a swim won't get you outside for a walk—not a stroll around the block, or a neon and cra power push. It's time for rugged walking.

alk tough

it observant trend-watcher knows that outdoor activity is booming. of the boomingest activities is the pedestrian style. But what's only being noticed is that a majority of the millions of Americans now ing active outdoor lifestyles aren't "doing" anything out there. They're cess they're getting fit and enjoying the great outdoors. ere in the fitness boom and the outdoor recreation craze, has slipped the notice of most media," says Robert Hoffman, a works on trail and river protection projects.

ost people don't want to climb Kilimanjaro or strap walking ms, but they want to be outdoors after spending the week stuck in an office or other indoor setting," says Hoffman. rugged walk in the outdoors

steps on a treadmill

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big challenge

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GDI to speed up video playback operations. Originally a key piece of the Windows 95 graphics architecture, DCI was recently abandoned in favor of Microsoft's newer and more powerful Direct Draw interface. See also *DDI* and *GDI*.

DDE (Dynamic Data Exchange) A mechanism used in Windows to transfer data between two applications or two separate instances of the same application. Windows itself uses DDE for a variety of purposes, from opening documents in running applications when a document icon is double-clicked in the shell to obtaining program icons for DOS applications. DDE is also used to support OLE. See also *OLE*.

DLL (dynamic link library) A special type of Windows program containing functions that other programs can call, resources (such as icons) that other programs can use, or both. Unlike a standard programming library, whose functions are linked into an application when the application's code is compiled, an application that uses functions in a DLL links with those functions at runtime—hence the term *dynamic*.

DMA (direct memory access) A technique that some hardware devices use to transfer data to or from memory directly without requiring the involvement of the CPU.

DRAM (dynamic random access memory) Pronounced "dee-ram." The readable/writable memory used to store data in personal computers. DRAM stores each bit of information in a "cell" composed of a capacitor and a transistor. Because the capacitor in a DRAM cell can hold a charge for only a few milliseconds, DRAM must be continually refreshed in order to retain its data. Static RAM, or SRAM, requires no refresh and delivers better performance, but it is more expensive to manufacture. See also *EDO RAM* and *SRAM*.

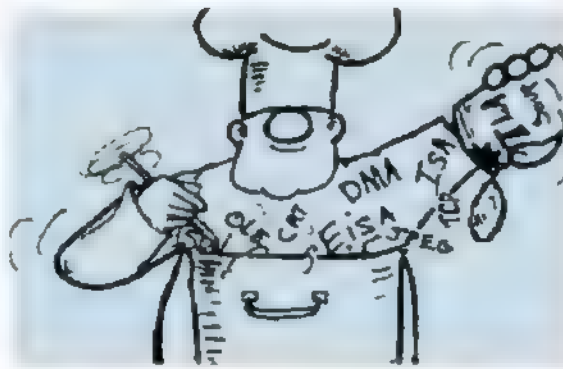
DSP (digital signal processor) A microprocessor-like device designed to process electrical signals very quickly, just as an FPU is designed to perform floating-point math at high speeds. DSPs are used for a variety of devices in personal computers, including high-speed modems, multimedia sound boards, and real-time audio/video compression and decompression hardware.

EDO RAM (extended data-out random access memory) A form of DRAM that speeds accesses to consecutive locations in memory by (1) assuming that the next memory access will target an address in the same transistor row as the previous one and (2) latching data at the output of the chip so it can be read even as the inputs are being changed for the next memory location. EDO RAM reduces memory access times by an average of about 10 percent compared with standard DRAM chips and costs only a little more to manufacture. EDO RAM has already re-

placed DRAM in many computers, and the trend is expected to continue.

EDRAM (enhanced dynamic random access memory) A form of DRAM that boosts performance by placing a small complement of static RAM (SRAM) in each DRAM chip and using the SRAM as a cache. Also known as *cached DRAM*, or CDRAM.

EEPROM (electrically erasable programmable read-only memory) Pronounced "ee-ee-prom."



The DCI component
works in
conjunction with the
GDI to speed up
display on your CRT.
It was recently
supplanted by DDI.

A special type of read-only memory (ROM) that can be erased and written electrically. EEPROM is frequently used for system-board BIOSes so that a computer's BIOS can be updated just like a piece of software. See also *ROM*, *EPROM*, and *BIOS*.

EIDE (Enhanced Integrated Device Electronics or Enhanced Intelligent Drive Electronics) An enhanced version of the IDE drive interface that expands the maximum disk size from 504MB to 8.4GB, more than doubles the maximum data transfer rate, and supports up to four drives per PC (as opposed to two in IDE systems). Now that hard disks with capacities of 1GB or more are commonplace in PCs, EIDE is an extremely popular interface. EIDE's primary competitor is SCSI-2, which also supports large hard disks and high transfer rates. See also *IDE* and *SCSI*.

EISA (Extended Industry Standard Architecture) Pronounced "ee-suh." An open 32-bit bus architecture developed by Compaq and a consortium of computer vendors to counter the proprietary Micro Channel architecture proffered by IBM. Unlike the Micro Channel, an EISA bus is backward-compatible with 8- and 16-bit expansion cards designed for the ISA bus. Despite its 32-bit design and other promising features (such as bus arbitration

and support for burst-mode data transfers), EISA never gained widespread acceptance, in part because of the substantially higher cost required to manufacture EISA buses and adapters.

EMS (Expanded Memory Specification) A bank-switched memory management scheme developed by Intel, Lotus, and Microsoft that allows MS-DOS applications (normally limited to 640K of memory) to access vast quantities of memory. The first widely accepted version of the EMS specification, Version 3.2, supported up to 8MB of memory, and Version 4.0 increased the limit to 32MB. Memory that conforms to this standard is often referred to as *expanded memory*. EMS memory has been all but made obsolete by protected-mode operating systems such as Windows.

EPP (Enhanced Parallel Port) A parallel port that conforms to the EPP standard developed by the IEEE (Institute of Electrical and Electronics Engineers) 1284 standards committee. The EPP specification transforms a parallel port into an expansion bus that can handle up to 64 disk drives, tape drives, CD-ROM drives, and other mass-storage devices. EPPs are rapidly gaining acceptance as inexpensive means to connect portable drives to notebook computers.

EPROM (erasable programmable read-only memory) Pronounced "ee-prom." A special form of ROM that can be erased by high-intensity ultraviolet (UV) light and then rewritten, or "reprogrammed," in a manner similar to common DRAM. EPROM chips normally contain UV-permeable quartz windows exposing the chips' internals. See also *ROM* and *EEPROM*.

FAT (file allocation table) Pronounced "fat." The file system used by DOS and 16-bit versions of Windows to manage files stored on hard disks, floppy disks, and other disk media. The file system takes its name from an on-disk data structure known as the *file allocation table*, which records where individual portions of each file are located on the disk. See also *VFAT*.

FPU (floating-point unit) A formal term for the math coprocessors (also called *numeric data processors*, or NDPs) found in many personal computers. The Intel 80387 is one example of an FPU. FPUs perform certain calculations faster than CPUs because they specialize in floating-point math, whereas CPUs are geared for integer math. Today, most FPUs are integrated with the CPU rather than packaged and sold separately. See also *CPU*.

FTP (file transfer protocol) A set of rules that allows two computers to talk to each other as a file transfer is carried out. This is the protocol used when you download a file to your computer from another computer on the Internet.

GDI (Graphics Device Interface) The component of Windows that permits applications to draw

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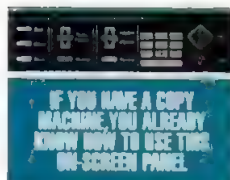
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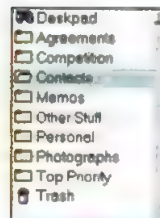
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on screens, printers, and other output devices. The GDI provides hundreds of convenient functions for drawing lines, circles, and polygons; rendering fonts; querying devices for their output capabilities; and more.

HTML (Hypertext Markup Language) An ASCII text-based, scriptlike language for creating hypertext documents like those on the Internet's World-Wide Web.

HPFS (High Performance File System) OS/2's native file system. HPFS offers superior performance compared with the FAT file system, supports long filenames, and can efficiently handle hard disks of virtually any size. See also *FAT*, *NTFS*.

IDE (integrated development environment) A term for products such as Microsoft's Visual C++ and Borland's Delphi that combine a program editor, a compiler, a debugger, and other development tools into one integrated unit. The forerunner of all modern IDEs, Borland's Turbo Pascal changed the way programmers write code by allowing programs to be edited and compiled within the same application.

IDE (Integrated Device Electronics or Intelligent Drive Electronics) A drive-interface specification for small to medium-size hard disks (disks with capacities up to 504MB) in which all the drive's control electronics are part of the drive itself, rather than on a separate adapter connecting the drive to the expansion bus. This high level of integration shortens the signal paths between drives and controllers, permitting higher data transfer rates and simplifying adapter cards. IDE drives have virtually replaced the Enhanced Small Device Interface (ESDI) drives that enjoyed widespread acceptance in the late 1980s. See also *EIDE* and *SCSI*.

I/O (input/output) A general term for reading and writing data on a computer. The term "file I/O," for example, refers to the act of reading or writing information in a disk file.

IRQ (interrupt request) A signal from a hardware device such as a keyboard or a drive controller indicating that it needs the CPU's attention. IRQ signals are transmitted along *IRQ lines*, which connect peripheral devices to a programmable interrupt controller, or PIC. The PIC prioritizes the incoming interrupt requests from different devices and delivers them to the CPU one at a time via a dedicated IRQ line connecting the PIC to the CPU.

ISA (Industry Standard Architecture) Pronounced "eye-suh." The 8- and 16-bit bus design featured in the IBM PC/AT and still used today in one form or another in most PCs. See also *EISA* and *MCA*.

ISDN (Integrated Services Digital Network) The CCITT (Comité Consultatif Internationale de Télégraphie et Téléphonie) standard that defines a digital communications network geared to replace the world's analog telephone systems. Among other things, ISDN

provides superior dial-up connections for transferring information between computers and connecting to the Internet, because it supports data transfer rates of 128 kilobits per second (Kbps), compared with 14.4 Kbps and 28.8 Kbps for the fastest modems. It also permits voice and data signals to share the same phone line.

JPEG (Joint Photographic Experts Group) Pronounced "jay-peg." A lossy image-compres-



OS/2 uses HPFS,
NT uses NTFS, DOS
uses FAT, and
Windows uses VFAT
to organize files
on your IDE, EIDE,
or SCSI disk.

sion algorithm that often reduces the size of bitmapped images by a factor of 10 or more with little or no discernible image degradation. JPEG compression works by filtering out an image's high-frequency information to reduce the volume of data and then compressing the resulting data with a lossless compression algorithm. Low-frequency information does more to define the characteristics of an image, so losing some high-frequency information doesn't necessarily affect the image quality.

LCD (liquid crystal display) A display technology that relies on polarizing filters and liquid-crystal cells rather than phosphors illuminated by electron beams to produce an on-screen image. To control the intensity of the red, green, and blue dots that comprise pixels, an LCD's control circuitry applies varying charges to the liquid-crystal cells through which polarized light passes on its way to the screen. The amount of light that makes it through to the screen depends on the amount of charge applied to the corresponding cell and thus the degree to which the light is "twisted" before it passes through a second polarizing filter and a red, green, or blue color mask. Laptops, notebooks, PDAs, and other types of portable computers common-

ly use LCDs. See also *CRT*.

MAPI (messaging application programming interface) Pronounced "map-e." An API developed by Microsoft and other computer vendors that provides Windows applications with an implementation-independent interface to various messaging systems such as Microsoft Mail, Novell's MHS, and IBM's PROFS. A subset of MAPI known as *Simple MAPI* lets developers easily create "mail-aware" applications capable of exchanging messages and data files with other network clients.

MCI (Media Control Interface) The Windows component that allows multimedia devices such as CD-ROM drives and videodisk players to be programmed using high-level function calls that insulate the software from the nuances of the hardware. You can use the MCI play command, for example, to play a song on an audio CD or a video clip on a videodisk player. MCI drivers provided with Windows translate the play command into low-level commands specific to the intended output device.

MIDI (Musical Instrument Digital Interface) Pronounced "middy." A specification that standardizes the interface between computers and digital devices that simulate musical instruments. Rather than transmit bulky digitized sound samples, a computer generates music on a MIDI synthesizer by sending commands just a few bytes in length characterizing the pitch and duration of sounds (and the instruments that produce them) through a unidirectional serial cable. Each channel of a MIDI synthesizer corresponds to a different instrument, or "voice," and you can program several channels simultaneously to produce symphonic sound.

MPEG (Motion Picture Experts Group) Pronounced "em-peg." A multimedia video playback standard that allows digital video to be compressed using a combination of JPEG image compression and a sophisticated form of *differencing*—encoding a video sequence by recording differences between frames rather than entire images of each frame. There are two MPEG standards: MPEG-1, which supports a playback quality roughly equal to that of a VCR, and MPEG-2, which supports high-quality digital video. MPEG-1 is the form normally used with personal computers. See also *JPEG*.

NOS (network operating system) An operating system such as Novell NetWare that provides basic file system services and supervisory functions to computers connected by a network.

NTFS (NT File System) The file system that is native to Microsoft Windows NT. NTFS is probably the most advanced file system available for personal computers, featuring superior performance, excellent security and crash protection, and the ability to handle large volumes of data. See also *FAT* and *HPFS*. □

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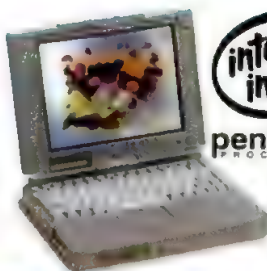


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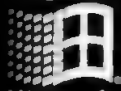
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PC Tech/Inside Windows 95

By Barry Simon

The Windows 95 Registry, Part 3

Customize icons and other seemingly hardwired OS components.

Although the Windows 95 Registry has greatly simplified the Windows 3.x configuration process, it is still a structure that requires extensive explanation. With this column—the last of a three-part series—we conclude our discussion of the Registry and its editor (Regedit.exe) with a scattering of shortcuts and clarifications. Part 1 (October 24, 1995) discussed the general structure of the Registry, a binary object that is divided into six different root keys. Part 2 (November 7, 1995) focused on the HKEY_CLASSES_ROOT (HKCR) key, which stores information for Windows 95 file types and document context menus.

As we discussed in both Part 1 and Part 2, the Registry is organized in a hierarchical tree that mirrors the Windows 95 file system. Registry keys behave like file folders, except they contain value entries instead of files. Each value entry has a name and stores a piece of data (string, binary, or 4-byte DWORD). Any given key must at least contain a Default value entry that identifies the key's purpose or points to another location within the Registry.

You can easily edit both keys and value entries, but you should always back up your original configuration before making any changes. To back up the Registry, select File | Export under the Registry Editor or manually copy User.dat and System.dat from your root directory. These two files contain the Registry's user-specific and system-specific information, respectively.

The Registry stores all user-specific information in the HKEY_CURRENT_USER (HKCU) root key and all system-specific information in HKEY_LOCAL_MACHINE (HKLM). Our discussion deals with various portions of these two keys.

THE HARDWIRED DESKTOP ICONS

Typically, the Windows 95 Desktop contains five hardwired icons that cannot be moved or deleted in the normal manner: My Computer, Network Neighborhood,

Inbox, The Microsoft Network, and Recycle Bin (the Windows 95 Plus! package adds a hardwired Internet icon). Depending on the extent of your installation, some of these icons may be absent. If you do not install Microsoft Exchange, for instance, the Inbox icon is not needed. My Briefcase is also a hardwired icon, but it is not anchored to the Desktop.

Each of these icons lacks a Delete item in its context menu, except for The Microsoft Network (whose presence on the Windows 95 Desktop was recently questioned by the U.S. Justice Department). The Registry, however, allows you to remove all these icons or migrate them to other locations.

EDITING THE HARDWIRED ICONS

Although you can remove Network Neighborhood by installing the System Policy Editor, it is much easier to do so via the Registry. Scroll to the HKCU\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer key and create a DWORD value entry called NoNetHood. If you set the value to 1 and re-

boot your system, the Network Neighborhood icon will fail to appear. To reinstate the icon, change the value to 0.

To make changes to the other hardwired icons, scroll to the HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\explorer\Desktop\NameSpace. Within this key, each icon has its own CLSID key (a 16-byte value, discussed in Part 2, that identifies individual objects) that points to a corresponding key in HKCR\CLSID. To delete an icon, remove the CLSID within NameSpace. To change an icon's name, edit the value of the sister key in HKCR\CLSID. The CLSIDs for each of the hardwired icons are as follows:

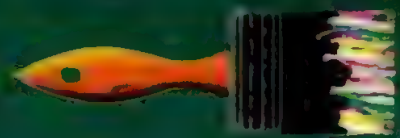
- My Computer: {20D04FE0-3AEA-1069-A2D8-08002B30309D}
- Network Neighborhood: {208D2C60-3AEA-1069-A2D7-08002B30309D}
- Recycle Bin: {645FF040-5081-101B-9F08-00AA002F954E}
- Inbox: {00020D75-0000-0000-C000-000000000046}
- The Microsoft Network: {00028B00-0000-0000-C000-000000000046}
- Internet Explorer: {FBF23B42-E3F0-101B-8488-00AA003E56F8}

If you want to edit the Recycle Bin icon, for instance, you must first find the key in HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\explorer\Desktop\NameSpace whose Default value reads Recycle Bin: {645FF040-5081-101B-9F08-00AA002F954E}. If you delete this key, then the system removes the Recycle Bin from the Desktop. You can simply rename the Recycle Bin, however, by scrolling to the corresponding CLSID (HKCR\CLSID\{645FF040-5081-101B-9F08-00AA002F954E}) and changing the name in its Default value.

You can also create new versions of these icons that have move, copy, and delete properties. The Microsoft Network icon, for instance, is represented by the {00028B00-0000-0000-C000-000000000046} CLSID. To create a



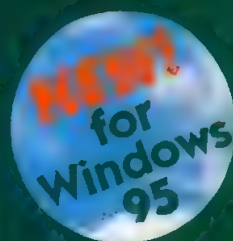
FIGURE 1: The first 42 icons in Shell32.dll are used for fundamental objects in Windows 95. When denoting them in the Registry, you must subtract 1 from the numbers listed here.



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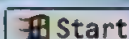


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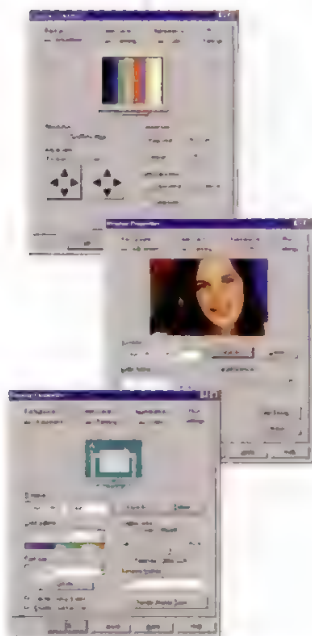
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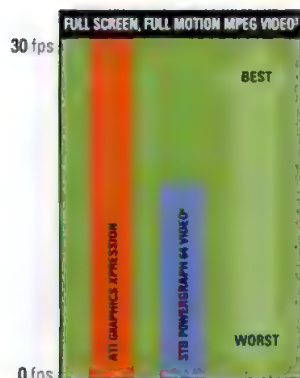
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CIRCLE 059 ON READER SERVICE CARD

new icon called MSNetwork, delete the HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\explorer\Desktop\NameSpace\{00028B00-0000-0000-C000-00000000046} key and create a new folder called:

MSNetwork.{00028B00-0000-0000-C000-00000000046}

A folder with this extension file retains the properties of the original MSN icon, but it can also be deleted or moved.

As we described in Part 1, you can change the My Computer icon by scrolling to HKCR\CLSID\{20D04FE0-3AEA-1069-

32.dll. The first 42 icons in that file are shown in Figure 1, which is a screen capture of Impact Software's Microangelo. Icons 006 and 007 are used for the floppy disk icons on the Desktop or in My Computer. The icon labeled 030 is used to indicate shortcuts, and 029 indicates shared drives, directories, and printers. The roles of other Shell32.dll icons are as follows:

- 001: Default document icon
- 008: tape drives
- 009: local hard disks
- 010: network hard disks
- 011: disconnected network drive
- 012: CD-ROM drive
- 014: Entire Network in Network Neighborhood

the following format:

N = Filename, n

N is a number from 0 to 42 that points to a particular icon in Shell32.dll. *Filename* is a path to an icon file, while *n* signifies an icon within that file.

Icon 030 in Figure 1, for instance, usually denotes a shortcut. If you want to use icon 031 for shortcuts, however, you need to create the following entry in the ShellIcons subkey (remembering to count from 0 rather than 1):

29 = C:\Windows\System\Shell32.dll,30

You can implement such changes without rebooting the system. So that Windows can load quickly, its current system icons are also stored in a hidden file called C:\Windows\ShellIconCache. When your system boots, it reads the necessary icons from this file or creates the file if it is not present. Windows reconstructs ShellIconCache on the fly, however, if you change your icon size settings. To do so, right-click on the Desktop, choose Properties, and move to the Appearance tab. Next, choose Icon from the Item menu. If

you change the icon size and click on Apply, Windows reconstructs the ShellIconCache folder and implements your changes to the

Registry (you can easily restore your icon size in the same manner).

DESKTOP ICON POSITIONS

Unfortunately, Windows 95 does not provide a simple mechanism for saving and restoring the positions of your Desktop icons. If you accidentally select Arrange Icons, Windows replaces your custom positions with a strict alphabetical ordering. To store your customizations, you must resort to a complicated Registry method that is machine-dependent and may even change over time.

Icon positions are usually stored within one of the 29 subkeys in HKCU\Software\Microsoft\Windows\CurrentVersion\Explorer\Streams. The subkeys are numbered from 0 to 28. On our Windows 95 machine, the positions were stored in HKCU\Software\Microsoft\Windows\CurrentVersion\Explorer\Streams\24.

To locate the Streams subkey in which your desktop is stored, highlight Streams in the Registry Editor, export it to a file called Loc.reg, and view it via Notepad. A Streams subkey usually contains two binary values, called CabView and ViewView (some only have a ViewView entry). Your desktop positions are stored in the subkey that has a small CabView entry and an immense ViewView entry. On our system, for instance, the

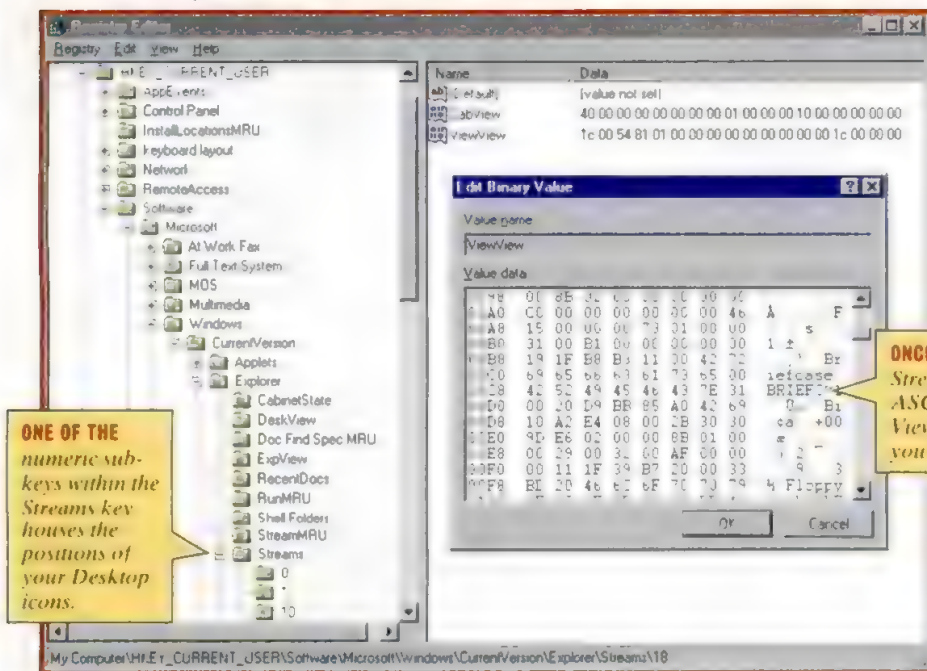


FIGURE 2: By copying the key that contains your Desktop icons and making a change to your Autoexec.bat, you can easily restore your Desktop customizations in the event of a mishap.

A2D8-8002B30309D)\DefaultIcon and identifying a new icon file in its Default value entry. You can use a similar method for the other hardwired icons; the only variable is the CLSID key. Simply move to the appropriate key under HKCR\CLSID, then move to the DefaultIcon subkey. Except with Recycle Bin, the Default value of this subkey is the full pathname of the file that contains the corresponding icon.

For Recycle Bin, three value entries are under DefaultIcon: Default, Empty, and Full. The Empty value points to the icon that represents an unoccupied Recycle Bin, while Full points to an icon that represents a Recycle Bin with at least one file in it. The current Recycle Bin icon is kept in Default.

FUNDAMENTAL SYSTEM ICONS

Windows 95 draws most of its fundamental system icons from the file C:\Windows\Shell-

- 016: computer in Network Neighborhood
- 017: printers in printer folder
- 019: workgroups in Network Neighborhood

As we mentioned in Part 1, when you access an icon in Windows 95, you must count from zero rather than one (the first icon is icon 0, the second is icon 1, and so on). If you wish to point to icon 007 in Figure 1, for instance, you must use the following format:

C:\Windows\System\Shell32.dll, 6

where 6 points to the seventh icon.

To change a system icon, you must create a new key called HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\explorer\ShellIcons (if you have the Windows 95 Plus! package installed, this key is already present). Entries in this key—which reassigns the functions of Shell32.dll icons—adhere to

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ViewView in the 24 subkey had 48 lines of data when viewed in Notepad, while the next-largest ViewView had only a line and a half.

Next, look at this same key within the Registry editor. Since Regedit displays data in both Hex and ASCII format, you should recognize desktop filenames in the ASCII viewer if you have chosen the correct subkey (see Figure 2).

Once you are certain you've located the right subkey, make sure Log.reg is in your root directory and add the following import command to your Autoexec.bat:

```
REM Regedit C:\Loc.reg
```

If you ever accidentally rearrange your desktop positions, remove the REM statement from the above line and reboot; your desktop will be restored. To retain a constant backup of your ever-changing desktop, reinstate the REM and re-export Loc.reg each time you make a major change. You must include the import statement in Autoexec.bat, because Windows saves the current desktop when you exit and rereads that configuration when you boot up.

Since Streams caches only recent Explorer data, however, it may drop the Desktop position subkey if that data is not frequently used. If this happens, you must shuffle your Desktop icons so that a new subkey is created. Once you find this new subkey, open up Loc.reg and change the subkey number at the top of the file. Finally, remove the REM from the import command in Autoexec.bat and reboot.

RUNNING PROGRAMS AT START-UP

To launch an application automatically at start-up under Windows 3.0, you had to insert a Run or Load command into WIN.INI. Windows 3.1 simplified this process with a Program Manager group called StartUp. Windows 95 contains a similar Startup folder that houses shortcuts (C:\Windows\Start Menu\Programs\Startup) and is also backward-compatible with .INI files.

In addition to these two methods, the Registry contains at least six additional keys that can load programs at start-up. The system automatically runs them at start-up. Four of these (Run, RunOnce, RunServices, and RunServicesOnce) reside in HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion, and two (Run and RunOnce) are under HKCU\Software\Microsoft\Windows\CurrentVersion.

As their names suggest, both RunOnce keys and the RunServicesOnce key are run only one time; they are run the next time Windows reboots, and then the system removes their contents from the Registry. The other keys are run each time you start up. The Run and RunOnce keys in HKLM contain applica-

tions that must be loaded and exited before any other programs are run. Such applications include install programs that reboot the machine and finish a setup before your normal collection of programs is launched.

When a program is launched from the Run or RunOnce keys in HKCU, it is restored to the state it held before the last shutdown. When such a program is notified of a shutdown, it stores its loaded files and other present parameters in these two keys. The RunServices and RunServicesOnce keys load programs before the login prompt appears. Keys under HKLM run for all users on a given machine, while keys under HKCU are user-specific.

ACCESSING INSTALLATION FILES

When you install additional Windows 95 files using Control Panel's Add/Remove Programs dialog, the system links to the files via the HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Setup key. A SourcePath value entry contains a path to a folder or a drive. If you installed Windows 95 from CD, SourcePath points to your CD-ROM drive. If you used floppy disks, it points to your floppy drive.

This value entry can be useful if you have copied the Windows 95 installation disks to your hard disk. If you copy the files to a folder called C:\Winstall, for instance, change the string value in SourcePath from A:\ to C:\Winstall. Thus, the system will always look to the correct folder when adding or removing programs.

THE RUN AND DOCUMENT HISTORY LISTS

When you select Run from the Start Menu, the resulting dialog lets you quickly launch an executable or open a folder. This dialog's history list—which contains the most recent items you have launched via Run—is stored in the HKCU\Software\Microsoft\Windows\CurrentVersion\Explorer\RunMRU key (MRU is a standard abbreviation for *most recently used*). This key contains up to 28 value entries (including its Default). If your history list is full, 26 entries are identified by the letters of the alphabet; these contain the last 26 commands (in ASCII format) that you entered into the Run dialog or Explorer's Go To dialog. The MRUList entry lists the 26 alphabetical keys according to how recently they were used; the first letter corresponds to the most recent command, the second letter to the second most recent command, and so on.

This method of storage is efficient; if you rerun one of the commands on the list, the system only has to change the order of the MRUList string. If you run a new command, the last letter in the MRUList string is moved to first position and the corresponding entry is changed; the other 25 value entries need not be altered. To delete an item from the history list, you must remove the appropriate

letter from MRUList and reboot the system.

If you select Document from the Start Menu, you can view the last 15 document files that you double-clicked on or opened via a Windows 95 common dialog. This list is spawned from the HKCU\Software\Microsoft\Windows\CurrentVersion\Explorer\RecentDocs key, which contains another MRUList value entry and 15 alphabetically named value entries. Each of these 15 entries houses the name of a document and the name of its shortcut in C:\Windows\Recent (in binary format).

ALIASES AND APP PATHS

The HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\App Path key contains a series of subkeys that identify executables with the format NAME.EXE. The Default value entry in such a key contains a path to the appropriate executable. A second key, called Path, may identify folders that are passed to that executable.

When you type NAME into the Run dialog, Windows first looks for it in the Windows folder, then in the system directory, then at the DOS path set up before Windows loaded. If it does not find an executable with that name in any of these locations, Windows looks in the App Paths key. If it finds a corresponding key, Windows runs the specified executable.

The name you type in does not have to be identical to the executable, but it must correspond to the name of the key. Consequently, you can use these keys to set up quick aliases for oft-used programs, batch files, or groups of applications. The Windows Interface Guidelines claim that if the user moves an executable, Windows adjusts these App Path entries, but our tests show this is not true.

EXAMINING THE REGISTRY

To gain a new perspective on the Registry, export it to a text file on your desktop, make a system change, and export the Registry a second time. Then, with a line-based file compare utility, locate all the alterations that the system made to the Registry. We used the Windows 3.1 Norton Deskedit, which has a powerful file compare (the file compare in the Windows 95 Norton Navigator locks up on such large files). You can also use Compare Versions in Word for Windows to observe alterations.

Knowing the correct .INI settings was often critical under Windows 3.x. Since Windows 95 is a richer and more complex environment, obscure Registry settings are even more important. □

Barry Simon is a contributing editor of PC Magazine and a coauthor of CD-MOM 95: The Mother of All Windows 95 Books (Addison-Wesley, 1995).

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CIRCLE 198 ON READER SERVICE CARD



By Gabrielle Gagnon

Exploring IBM's SOM, Part 3

Create customized SOM objects for your OS/2 desktop.

After our initial overview of the Workplace Shell (WPS) and the System Object Model (SOM) used by OS/2 (October 10, 1995), Part 2 of our SOM series (November 7, 1995) elucidated the SOM/WPS class hierarchy and introduced the RexxUtil library functions that work with WPS. In this column—the last of our three-part series—we will detail various REXX setup strings that you can use to customize your desktop.

If you've explored OS/2's Workplace Shell, you are probably aware of the myriad options available in a WPS object's Settings Notebook. Each of these settings is also configurable through the setup strings in the SysCreateObject and SysSetObjectData RexxUtil functions. Thus, you can use REXX to customize objects, in addition to configuring them through the Settings Notebook or with drag-and-drop. In many cases, it may be faster to use direct manipulation instead of writing a REXX program, but these RexxUtil functions are real lifesavers when you have a large number of workstations to set up. Configuring a desktop with REXX is also an effective security measure, since you can restore lost or corrupted objects simply by running the REXX program again.

CREATING A CUSTOM LAUNCHPAD

Suppose you are a network administrator and you need to create custom LaunchPads for each of your users. Each department wants its most-used applications to reside on a bar that is separate from the standard OS/2 LaunchPad—the operations department mostly uses scheduling tools, for example, while marketing mostly uses spreadsheets and word processors.

Unfortunately, OS/2 does not have a template for LaunchPads; if you want to create a new LaunchPad via the Settings Notebook, you must create a copy of the standard LaunchPad and delete all of its objects (drag them to the shredder or select the Delete option from the object's pop-up menu). Then, you must repopulate the LaunchPad by dragging and dropping new program objects onto it. Since LaunchPad settings are not saved to a separate disk file (WPLaunchPad is descended from WPAbstract), you cannot copy

them to a disk for distribution. Consequently, you must start from scratch with every desktop. Producing a customized LaunchPad seems simple initially, but you will probably wish you had applied for another job by the time you finish your tenth workstation.

OBJECT IDS

You can, however, accomplish this same task using REXX. First, you need to find out which applications each department wants to load. Let's say the operations department wants to place several OS/2 productivity tools on a new LaunchPad: Calculator, Calendar, Daily and Monthly Planners, a Clock, and the To-Do List. The department wants the Monthly Planner to be placed in a drawer above the Daily Planner and the Clock above the To-Do List.

To access these objects in REXX, you need to know their object IDs or their path and file names—if they have any. Object IDs are preferable, since objects may be moved. Object IDs are unique to each object and are surrounded by angle brackets:

```
<objectname>
```

Default IDs are assigned to all the standard WPS objects, and most of them start with the same three characters: WP_. For your own objects, therefore, you should avoid assigning object IDs that start with those characters.

The sidebar "Default Workplace Shell Objects" shows default object IDs for most of the WPS objects that come with OS/2 Warp. We

will further explain the referencing of IDs later in this column, but for now these are the IDs that are required for our example:

- Calculator: <WP_DCALC>
- Calendar: <WP_DCALEM>
- Daily Planner: <WP_DDIARY>
- Monthly Planner: <WP_DMNTH>
- To-Do List: <WP_TODO>
- Clock: <WP_CLOCK>

Object IDs are case-sensitive; <WP_LAUNCHPAD> is not the same object as <WP_LaunchPad>, so be careful how you enter them, or the WPS may not find the object you want.

THE SYSCREATEOBJECT FUNCTION

Now that we have the required object IDs, we can set up a new LaunchPad via the SysCreateObject RexxUtil function, which lets you instantiate and configure a new object. It takes five parameters, including the object's Class, Title, and Location, as well as an optional Setup String and Option Code. In the event that the object you need already exists, the Option Code offers one of three alternatives: It will fail (F), which is the default if you do not specify an Option Code; replace the existing object (R); or update the existing object (U). The update option will overwrite existing properties with the new properties that are provided in the Setup String.

A Setup String is a set of keyword=value combinations separated by semicolons:

```
call RxFuncAdd 'SysCreateObject', 'RexxUtil', 'SysCreateObject';

setupString = ,
  'OBJECTID=<OpsLaunchPad>;' ||,
  'FPOBJECTS=<WP_DCALC>,<WP_DCALEM>,<WP_DDIARY>,<WP_TODO>;' ||,
  'DRAWEROBJECTS=3,<WP_DMNTH>;'

rc = SysCreateObject('WPLaunchPad', 'Operations Launch Pad', ,
  '<WP_DESKTOP>', setupString );
if rc = 1 then
  say 'Launchpad object created w/Rexx'
else say 'Could not create Launchpad w/Rexx'
```

FIGURE 1: This piece of REXX code attempts to create a new LaunchPad object and displays the results of the attempt.



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Default Workplace Shell Objects

Object name	Object ID	Object class	Location	Object name	Object ID	Object class	Location
16-color palette	<WP_LORESCLRPA>	WPColorPalette	<WP_CONFIG>	Nowhere	<WP_NOWHERE>	WPFolder	<WP_DESKTOP>
256-color palette	<WP_HIRESCLRPA>	WPColorPalette	<WP_CONFIG>	OS/2 chess	<WP_CHESS>	WPPProgram	<WP_GAMES>
Application considerations	<WP_APPLBK>	WPPProgram	<WP_INFO>	OS/2 full screen	<WP_OS2FS>	WPPProgram	<WP_PROMPTS>
Calculator	<WP_DCALC>	WPPProgram	<WP_TOOLS>	OS/2 system	<WP_OS2SYS>	WPFolder	<WP_DESKTOP>
Calendar	<WP_DCALEM>	WPPProgram	<WP_TOOLS>	OS/2 system editor	<WP_SYSED>	WPPProgram	<WP_TOOLS>
CD player	<MMPM_CDPLAYER1>	WPPProgram	<MMPM2_FOLDER>	OS/2 window	<WP_OS2WIN>	WPPProgram	<WP_PROMPTS>
Clipboard viewer	<WP_CLIPV>	WPPProgram	<WP_TOOLS>	PCMCIA plug-and-play	<WP_CMPNP>	WPCmpnp	<WP_CONFIG>
Command prompts	<WP_PROMPTS>	WPFolder	<WP_DESKTOP>	Performance considerations	<WP_PERFBK>	WPPProgram	<WP_INFO>
Command reference	<WP_CMDREF>	WPPProgram	<WP_INFO>	Picture viewer	<WP_PICV>	WPPProgram	<WP_TOOLS>
Country	<WP_CNTRY>	WPCountry	<WP_CONFIG>	PM chart	<WP_CHART>	WPPProgram	<WP_TOOLS>
Daily planner	<WP_DIARY>	WPPProgram	<WP_TOOLS>	Power management	<WP_POWER>	WPPower	<WP_CONFIG>
Database	<WP_DBASE>	WPPProgram	<WP_TOOLS>	Printer	<WP_PDVIEW>	PDView	<WP_DESKTOP>
Desktop	<WP_DESKTOP>	WPDesktop	<WP_DESKTOP>	Printing information	<WP_PRINTBK>	WPPProgram	<WP_INFO>
Device-driver install	<WP_DDINST>	WPPProgram	<WP_CONFIG>	Productivity	<WP_TOOLS>	WPFolder	<WP_DESKTOP>
Digital audio player	<MMPM_DAPLAYER1>	WPPProgram	<MMPM2_FOLDER>	Pulse	<WP_PULSE>	WPPProgram	<WP_TOOLS>
DOS from drive A:	<WP_DOS_DRV_A>	WPPProgram	<WP_PROMPTS>	ReadMe	<WP_RDME>	WPSshadow	<WP_INFO>
DOS full screen	<WP_DOSFS>	WPPProgram	<WP_PROMPTS>	REXX information	<WP_REXREF>	WPPProgram	<WP_INFO>
DOS window	<WP_DOSWIN>	WPPProgram	<WP_PROMPTS>	Scheme palette	<WP_SCHPAL28>	WPSchemePalette	<WP_CONFIG>
Drives	<WP_DRIVES>	WPDrives	<WP_DESKTOP>	Seek and scan files	<WP_SEEK>	WPPProgram	<WP_TOOLS>
Dual boot	<WP_DBOOT>	WPPProgram	<WP_PROMPTS>	Selective install	<WP_INST>	WPPProgram	<WP_CONFIG>
Enhanced editor	<WP_EPM>	WPPProgram	<WP_TOOLS>	Shredder	<WP_SHRED>	WPShredder	<WP_DESKTOP>
Font palette	<WP_FNTPAL>	WPFontPalette	<WP_CONFIG>	Solitaire-Klondike	<WP_KLDK>	WPPProgram	<WP_GAMES>
Games	<WP_GAMES>	WPFolder	<WP_DESKTOP>	Sound	<WP_SOUND>	WPSound	<WP_CONFIG>
Glossary	<WP_GLOSS>	Mindex	<WP_INFO>	Spooler	<WP_SPOOL>	WPSpool	<WP_CONFIG>
Icon editor	<WP_ICON>	WPPProgram	<WP_TOOLS>	Spreadsheet	<WP_SPREAD>	WPPProgram	<WP_TOOLS>
Information	<WP_INFO>	WPFolder	<WP_DESKTOP>	Startup	<WP_START>	WPStartup	<WP_DESKTOP>
Keyboard	<WP_KEYB>	WPKeyboard	<WP_CONFIG>	System	<WP_SYSTEM>	WPSystem	<WP_CONFIG>
LaunchPad	<WP_LAUNCHPAD>	WPLaunchPad	<WP_DESKTOP>	System clock	<WP_CLOCK>	WPClock	<WP_CONFIG>
Mahjongg game	<MAH_EXE>	WPPProgram	<MAH_FOLDER>	System setup	<WP_CONFIG>	WPFolder	<WP_DESKTOP>
Mahjongg solitaire	<MAH_FOLDER>	WPFolder	<WP_GAMES>	Templates	<WP_TEMPS>	WPTemplates	<WP_DESKTOP>
Maintenance desktop	<WP_MAINT>	WPDesktop	<WP_DESKTOP>	To-do list	<WP_TODO>	WPPProgram	<WP_TOOLS>
Master help index	<WP_MINDEX>	Mindex	<WP_INFO>	Touch	<WP_TOUCH>	WPTouch	<WP_CONFIG>
MIDI music player	<MMPM_MIDIPLAYER1>	WPPProgram	<MMPM2_FOLDER>	Trademark credits	<WP_TRADEMBK>	WPPProgram	<WP_INFO>
Migrate applications	<WP_MIGAPP>	WPPProgram	<WP_CONFIG>	Tutorial	<WP_TUTOR>	WPPProgram	<WP_INFO>
Minimized window viewer	<WP_VIEWER>	WPMinWinViewer	<WP_DESKTOP>	Uninstall	<WP_UNINST>	WPPProgram	<WP_CONFIG>
MM data converter	<MMPM2_MMCONVERTER>	WPPProgram	<MMPM2_FOLDER>	Video player	<MMPM2_SOFTWARE_MOTION_VIDEO1>	WPPProgram	<MMPM2_FOLDER>
Monthly planner	<WP_DMNTH>	WPPProgram	<WP_TOOLS>	Volume control	<MMPM2_MASTERVOLUME_D>	WPPProgram	<MMPM2_FOLDER>
Mouse	<WP_MOUSE>	WPMouse	<WP_CONFIG>	WIN-OS/2 full screen	<WP_WINF>	WPPProgram	<WP_PROMPTS>
Multimedia folder	<MMPM2_FOLDER>	WPFolder	<WP_DESKTOP>	WIN-OS/2 window	<WP_WIN2WIN>	WPPProgram	<WP_PROMPTS>
Multimedia information	<WP_MULTIMBK>	WPPProgram	<WP_INFO>	WIN-OS2 setup	<WP_WINCFG>	WPWinConfig	<WP_CONFIG>
Multimedia setup	<MMPM2_SETUP>	WPPProgram	<MMPM2_FOLDER>	Windows in OS/2	<WP_WINOS2BK>	WPPProgram	<WP_INFO>
Network	<WP_NETWORK>	WPNetwork	<WP_DESKTOP>				

```
EXENAME=C:\MDOS\BASIC.COM;
STARTUPDIR=C:\MDOS;
PROGTYPE=VDM;
```

Keywords represent object properties that vary depending on the class of the object and where it falls in the WPS hierarchy.

There are keywords and options to control every characteristic that you can configure from a Settings Notebook and even several that you cannot. They offer a wide range of functions, from defining an object ID to designating a session type to restricting whether an object can be viewed or deleted.

The sheer number of setup options available can be daunting to a novice, which may be why the general REXX documentation provides only a few samples. They are too lengthy to print here, but we have posted a

file on PC Magazine Online with most of the setup options we think would be useful to a system administrator. They are grouped in tables by class, starting with WPObject. Since properties and behavior are inherited, the WPObject settings are available to all of its subclasses. For subclasses, we show only settings that override or extend those of their parent class. For a diagram showing the hierarchy of WPS classes, see Part 1 and Part 2 of our SOM series.

CREATING A LAUNCHPAD VIA REXX

Figure 1 shows REXX code for creating a new LaunchPad and populating it with the applications specified earlier. Notice that we are setting up a variable for the setup string and concatenating the keyword=value combinations via the || character. This is mainly for

readability; you could also type in the setup string as a literal. You should also note the commas placed at the end of some lines. In REXX, a comma at the end of a line denotes that the code continues on the next line. If you happen to break your lines differently from our example, make sure you have placed commas in the right places.

The keyword FPOBJECTS adds new objects to the right end of a horizontally configured palette or to the top of a vertically configured one. Technically, this code adds shadows of objects to a LaunchPad, not the original objects themselves. But you do not have to create a shadow explicitly, since the LaunchPad automatically does that for you. The syntax is

```
FPOBJECTS=objectID1, objectID2,
-objectID3...;
```


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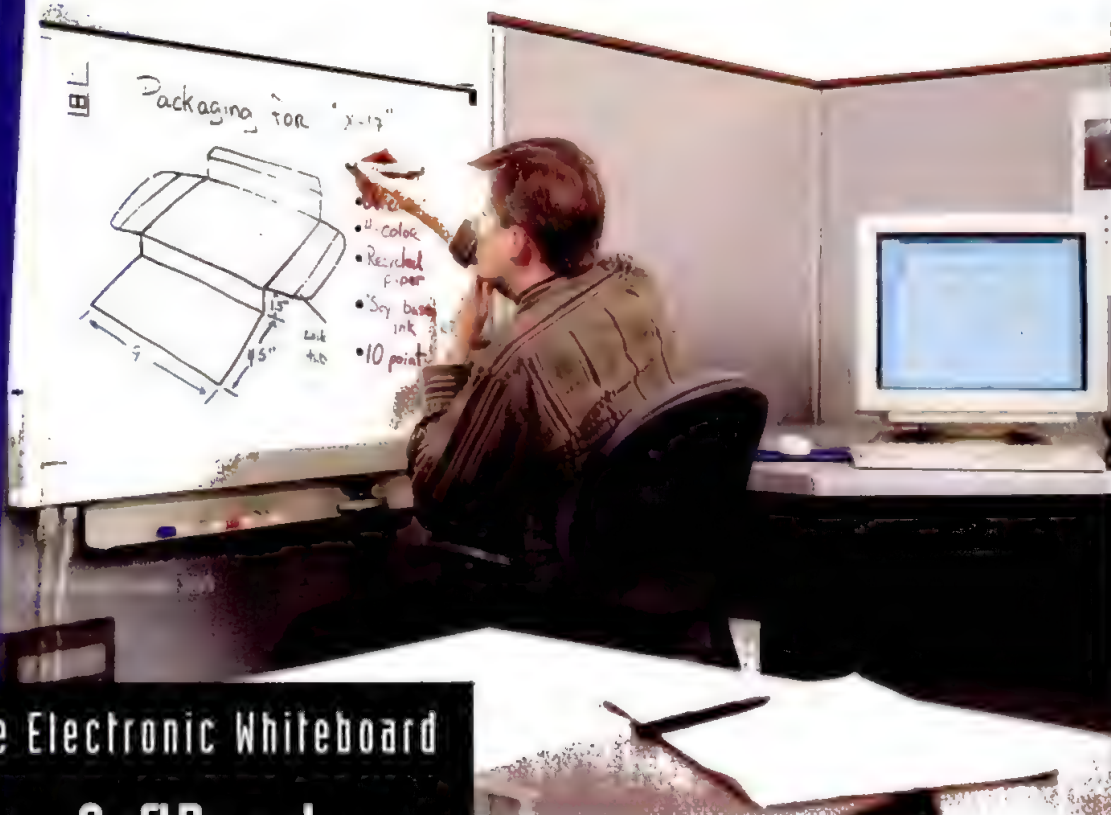
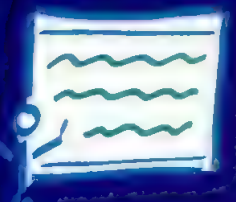
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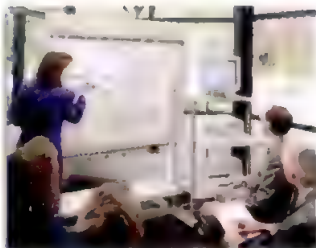


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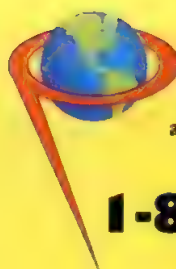
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```
call RxFuncAdd 'SysSetObjectData', 'RexxUtil', 'SysSetObjectData';

setupString = ,
'DRAWEROBJECTS=4,<WP_CLOCK>;' ||,
'LPTEXT=YES;' ||,
'LPDRAWERTEXT=YES;'

rc = SysSetObjectData('<OpsLaunchPad>', setupString );
if rc = 1 then
    say 'Successfully added objects to Launchpad'
else say 'Could not add objects to Launchpad'
```

FIGURE 2: To add descriptions to object icons on a LaunchPad, you can use the SysSetObjectData function.

```
call RxFuncAdd 'SysCreateObject', 'RexxUtil', 'SysCreateObject';

setupString = ,
'OBJECTID=<MyEditor>;' ||,
'EXENAME=\OS2\E.EXE';

rc = SysCreateObject('WPPProgram', 'System Editor',..
'<WP_DESKTOP>', setupString );
if rc = 1 then
    say 'Program object created w/Rexx'
else say 'Could not create Program w/Rexx'
```

FIGURE 3: If you do not know an application's object ID, you can create a program reference object and assign it a new ID.

```
call rxFuncAdd 'SysLoadFuncs', 'REXXUTIL', 'SysLoadFuncs'

call sysloadfuncs

result = SysInfl( 'USER', 'PM_Workplace:Location', 'ALL:', 'ids.')
if result \= 'ERROR:' then
    do i = 1 to ids.0
        say ids.i
    end
```

FIGURE 4: You can display a list of active object IDs via this terse REXX program.

Notice that you must use commas to separate the object IDs and a semicolon to end the setup string. The ellipsis (...) indicates that the series may go on indefinitely. In our case, we are adding to the palette from left to right: a shadow of the Calculator, Calendar, Daily Planner, and To-Do List. (Horizontal LaunchPads are the default.)

DRAWEROBJECTS adds objects to a drawer above one of the palette items. A drawer is depicted by a small bar; if the drawer contains any objects, a notch is displayed in the middle of it. The syntax is

```
DRAWEROBJECTS= drawer_number,
objectID1, objectID2,....;
```

Drawers are identified by number and are sequenced from left to right (or bottom to top on a vertical LaunchPad). In our example, the

palette contains 4 objects, and the Daily Planner is in position 3. Since we wanted to place the Monthly Planner above the Daily Planner, it goes in drawer 3. Notice that a comma separates the drawer number from object IDs and the object IDs from each other. You can place more than one object in a drawer, but you can configure only one drawer at a time because of the syntax.

Therefore, Figure 1 does not have an entry that places a Clock in the drawer above the To-Do List. To place objects in additional drawers, you would use SysSetObjectData to modify the newly created LaunchPad.

THE SYSSETOBJECTDATA FUNCTION

SysSetObjectData lets you change the settings of existing objects. It is much simpler than using SysCreateObject, which can serve the same purpose when used with the update

option (U). The syntax for SysSetObjectData is as follows:

```
result=SysSetObjectData('NameofObject',
➔'Setup')
```

The variable *result* is a return code. The function returns 1 if it is successful and 0 if it is not. If you tried to update an object that did not exist on the desktop, for instance, the function would fail. *NameofObject* can be either the object ID or, in the case of WPFileSystem descendants, a file system path of the object you want to update. (Remember that objects derived from WPFileSystem correspond to directories and files. Any other type of object requires an object ID.) *Setup* is a setup string that uses the same format as the one in SysCreateObject.

In our LaunchPad customization, we still need to add a Clock to the drawer above the To-Do List in addition to making some other changes. After creating the operations LaunchPad, we discover that the icons for each of the objects are almost indistinguishable, and the users would prefer seeing a description of each item instead of just the icon. Figure 2 shows how to use SysSetObjectData to do this. Notice that the properties LPTEXT and LPDRAWERTEXT are set to YES to display the object titles beneath the icons. LPTEXT is used for palette objects and LPDRAWERTEXT is used for drawer objects.

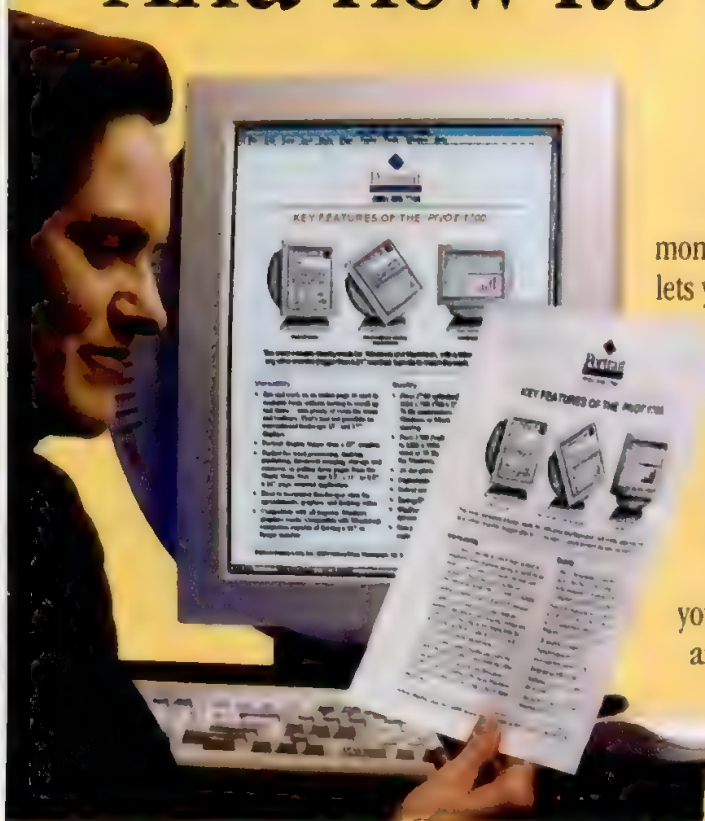
Now that we have our programs, we can copy them to each of the workstations and run them. One other thing to be careful of when updating objects: In most cases, you should close the object before updating it. LaunchPads get scrambled if you mess with them while they are open. To unscramble them, just close and reopen.

DISCERNING OBJECT IDS

Finally, the marketing department wants Microsoft Word and Excel on its LaunchPads along with some other lesser-known packages. In all of our examples so far, we either assigned object IDs to new objects or used default IDs for objects that shipped with OS/2; we have not worked with applications that were added later. There are several ways to discern which object ID to use.

First, you could create a program reference object for the application and assign it an object ID. Creating a program reference object is the same as dragging a Program template to the desktop and configuring it. At a minimum, you need to know the location of the program's .EXE file. You probably also want to know if it takes any parameters and what its working directory is. These options are set with the EXENAME, PARAMETERS, and STARTUPDIR keywords, respectively.

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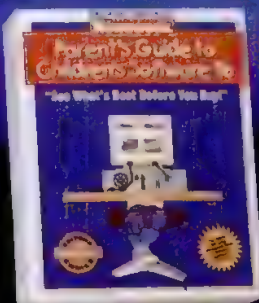
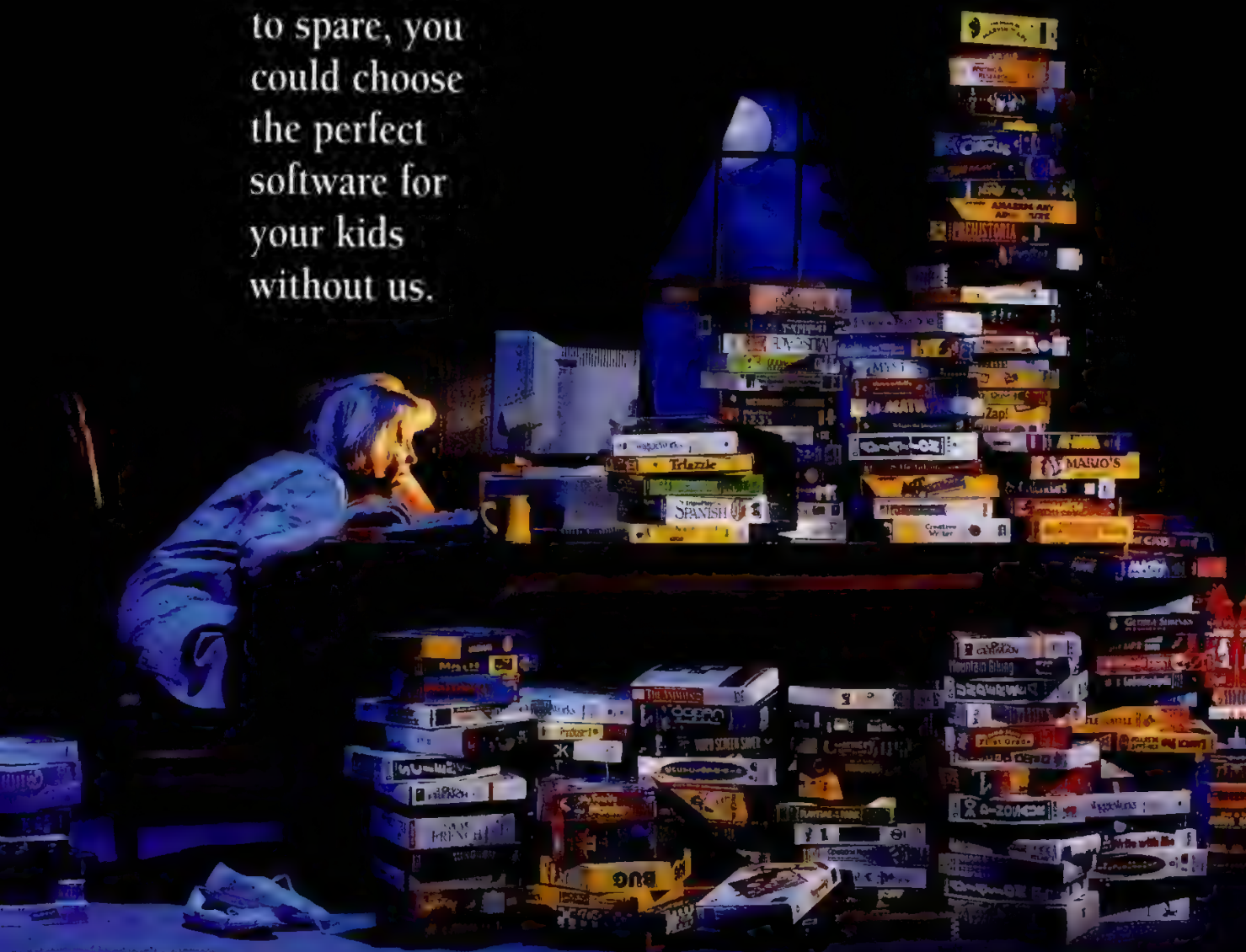


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Figure 3 creates a program reference for the OS/2 System Editor. We placed the new program object in the desktop folder, but you can place it in any folder you like. This program already had a reference object, but you may not know its default ID. The main point here is that if you create a new program reference, you must assign it an object ID so you know what to call it when you use it in other functions.

Another, more adventuresome approach is to check the list of existing object IDs and make an educated guess. You can use the SysINI RexxUtil function to find out which object IDs are currently registered with the WPS. (The SysINI function can also perform several other tasks, but they are not relevant to this column.)

A more adventuresome approach to finding an object's ID is to check the list of existing IDs using the SysINI RexxUtil.

The code sample shown in Figure 4 displays a list of active object IDs. Since the list will be long, you may want to output the result to a file. The WPS assigns an object ID if you do not specify one, and some of these IDs can be quite cryptic. Browsing through the list resulting from our program, we found that <WP_CWINWORDWINWORD> and <WP_CEXCELEXCELTAMICROSOFT> are likely candidates for Microsoft Word and Excel. After trying them in a REXX routine, we found that our assumptions were correct.

For DOS and Windows packages, hunting for an existing object ID may be a better solution than starting from scratch, since the existing objects were probably set up through the migration database and they may need special settings. If you are really gung ho about doing it yourself, the DATABASE.TXT file in the OS2/INSTALL directory catalogs all the settings you will need for dozens of DOS/Windows programs.

EXPLORING THE WORLD OF SOM

We hope that this series of articles has given you a glimpse of the power and versatility of the Workplace Shell and encourages you to continue exploring the world of SOM on your own. □

Gabrielle Gagnon is a Boston-based information technologies manager.

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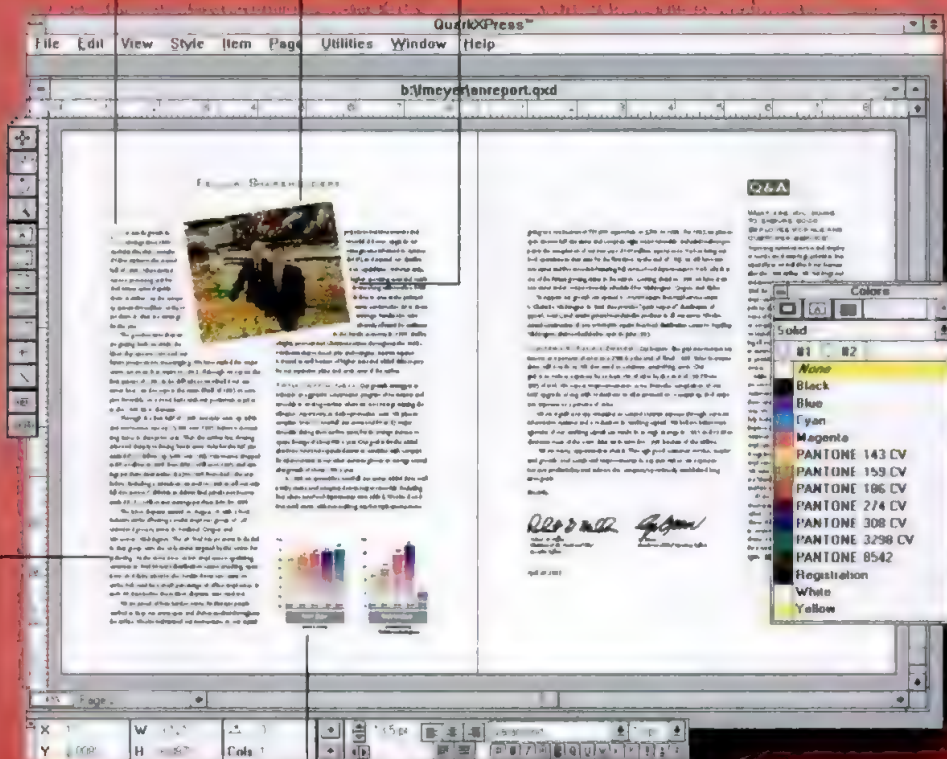
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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Use CHOICE to Compare, Parse, and Pad Strings

A question posed in the Solutions column of July 1995 sought a technique for testing whether a given date fell before or after another date. Your solution—CMPDATE.BAT—inspired me to devise a more general comparison procedure. COMPARE.BAT (Figure 1) has only three working lines, but it can be used to compare any two strings.

It uses the SORT filter and DOS 6.x's CHOICE command, which returns the result as an ERRORLEVEL. The calling procedure can then branch based on tests of the appropriate errorlevel. Note that if the strings to be compared contain numbers, the numbers must be right-justified and zero-filled. That is, 002 and 102 can be compared correctly, but 2 and 102 will give the wrong result.

I developed PAD.BAT (Figure 2) to take care of right-justifying and padding the numbers for comparison. PAD uses CHOICE to parse the input string and a recursive call to assemble a padded result. It will right-justify the string at the end of whatever string you pass as its second parameter; the default is a string of ten

zeros. Note that neither the padding string nor the string to be padded may include delimiter characters (space, tab, semicolon, comma, and so on), and the padding string can't contain wildcards (?, *).

The padded input string will be returned in the environment variable [N], but if the input string happens to be as long or longer than the padding string, the input string will be returned unchanged.

I've included the batch file NUMCOMP.BAT (Figure 3) as an illustration of how COMPARE and PAD can be used to compare numbers.

THOMAS LAVEDA, Clifton, Virginia

PC MAGAZINE: These two batch files use the CHOICE command in revolutionary new ways. COMPARE.BAT uses CHOICE to convert text-type information into a DOS errorlevel that can be checked in other batch files. PAD.BAT uses CHOICE to split a text string into separate characters. Both of these ground-breaking techniques should be added to your bag of batch file tricks—once you understand them.

To understand COMPARE.BAT, we'll analyze it from the inside out. The central command in this batch file actually appears at the very end of the file:

CHOICE /CLEG /N

The /N switch tells CHOICE not to display its options, and the /CLEG switch indicates that CHOICE should accept only the characters L, E, or G as input and set the errorlevel to 1, 2, or 3, respectively.

CHOICE's input is piped in from the SORT command. No matter how much text comes from SORT, however, CHOICE will ignore everything after the first acceptable character. The /+2 switch tells SORT to sort its input starting in the second character position; the first character will be ignored for sorting purposes.

The FOR command pipes three strings into the SORT command, which sorts them starting in the second character position. The three strings are built as follows:

- L! followed by the first parameter
- E! followed by the third parameter and a tilde
- G! followed by the second parameter

```
:: COMPARE.BAT - A generalized comparison routine for DOS 6.xx
::
:: Syntax: COMPARE Num1 Num2
::
:: Result of comparison returned
:: as an ERRORLEVEL -
::
:: ERRORLEVEL 1 means Num1 < Num2
:: ERRORLEVEL 2 means Num1 = Num2
:: ERRORLEVEL 3 means Num1 > Num2
::
@ECHO OFF
IF [%1]==[%2] %0 %1 ~ !
%COMSPEC% /C > NUL FOR %%v IN (L!%1
E!%3~ G!%2) DO ECHO.%%v | SORT /+2
| CHOICE /CLEG /N
```

FIGURE 1: COMPARE.BAT uses the CHOICE command to convert its result into an errorlevel.

HIGHLIGHTS



HARDWARE Two game ports will confuse your computer, but there is still a way to get two joysticks to work on one machine. Page 298



WORD PROCESSING A workaround for Microsoft Word for Windows that lets you modify the numbering scheme in a document. Page 304



DATABASES Find out how to exit both Microsoft Access and Windows at the same time, no matter which version of Access you happen to be using. Page 308

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If you passed the strings "foo" and "bar" to COMPARE.BAT, the three strings sent to SORT would be "L!foo", "E!~", and "G!bar". The tilde is the last printable character in the standard 7-bit ASCII sequence, so the "E!~" string will come last. The first string will be "G!bar", because bar is less than foo. Thus the first character in SORT's output will be G. This is the third option in CHOICE's list, so CHOICE sets the errorlevel to 3. If the first parameter were less than the second, the first character in the output would be L, and CHOICE would set the errorlevel to 1.

```
:: PAD.BAT - A routine to pad a
:: string to a selected number of
:: characters.
:: Requires DOS version 6.xx
:: Syntax: PAD Str [PadStr]
:: where Str is a string to be
:: padded, such as a number
:: PadStr is an optional string
:: to use in padding, such as a
:: string of zeros. If not provided,
:: a string of ten zeros is used.
@ECHO OFF
IF NOT '%3'==' ' GOTO REENTER
IF '%2'==' ' %0 %1 0000000000
SET (N)=%1
> {T}.BAT ECHO:; | CHOICE /C=%1; SET
>> {T}.BAT ECHO:; | CHOICE /C=%2; %0=
{T}
:REENTER
DEL {T}.BAT
FOR %%v IN (%%) DO SHIFT
SET [=
:LOOP
IF NOT '%2'==' ' SET [=%%2
SHIFT
IF NOT '%2'==' ' IF NOT
'%2'==' ' GOTO LOOP
SET (N)=%%(N)%
SET [=
```



FIGURE 2: PAD.BAT right-justifies its first parameter within the string specified as its second parameter; it uses the CHOICE command to split both parameters into individual characters.

To prevent this series of commands from producing unwanted output on the screen, the entire routine is executed under a secondary command processor whose output is redirected to the NUL device. The command

%COMSPEC% /C > NUL

at the start of the line produces this effect.

If the two strings are identical, the next-to-last line reexecutes COMPARE.BAT, passing it the first parameter, a tilde, and an exclamation mark. For example, if both parameters were "snafu", this line would reexecute COMPARE.BAT, passing "snafu", "~", and "!", and

the three strings passed into SORT will be "L!snafu", "E!~", and "G!~". Because the exclamation mark is the first printable character and tilde is the last, the line beginning with E will always come first in SORT's output. CHOICE will receive E as input and set the errorlevel to 2. Perfect!

Well, almost perfect; ASCII control characters (values below 32) and extended ASCII characters (values above 127) can cause problems. Pass two identical strings that begin with a control character and COMPARE.BAT will report that the first one is less than the second. Pass two different strings beginning with non-alphabetic extended ASCII characters and COMPARE.BAT will report that they are equal. This is almost never a problem, but if necessary you can minimize the chance of trouble by replacing all exclamation marks in the batch file with ^A (Ctrl-A) and replacing all tildes with ASCII character 255.

PAD.BAT uses CHOICE in a completely different fashion, but one that requires an equally detailed explanation. The secret here is the way CHOICE displays a set of choices. As an experiment, type this at the command line:

CHOICE /C=PCMag; SET

CHOICE will prompt you for a response; press the semicolon key. The resulting line on the screen will look like this:

SET[=,P,C,M,A,G,:]?;

If this line were executed in a DOS batch file, it would set the value of an environment variable whose name is a left square bracket ([) to a string containing the letters in PCMag, capitalized and separated by commas. PAD.BAT uses a variation on this line to create the first line of the temporary batch file {T}.BAT.

A very similar line generates the second line of {T}.BAT, but in this case the line begins with the name of the calling batch file (represented by the %0 parameter). On the command line, the Equal sign is simply a delimiter, so this line reexecutes PAD.BAT, passing the characters in the pad string as parameters. For example, the command

PAD foo XXXXXX

will result in a temporary batch file containing these two lines:

```
SET[=,F,0,0,:]?;
pad[=,X,X,X,X,X,X,:]?;
```

When PAD.BAT is reentered from {T}.BAT, it first deletes the temporary batch file, then uses the FOR command to call SHIFT once for each element in the value of the environment variable [. This has the effect of discarding as

```
@ECHO OFF
ECHO Comparing "%1" with "%2"
CALL PAD %1
SET N1=%{N}%
CALL PAD %2
CALL COMPARE %N1% %N)%
FOR %%v IN (1 2 3) DO IF ERRORLEVEL
%%v GOTO Label%%v
:Label1
ECHO %1 is less than %2
GOTO End
:Label2
ECHO %1 is equal to %2
GOTO End
:Label3
ECHO %1 is greater than %2
:End
```



FIGURE 3: NUMCOMP.BAT uses PAD and COMPARE to compare two numbers and report which is greater.

many characters of the pad string as are present in the string to be padded. The batch file then clears the { variable and builds a new value for it by assembling the remaining command line parameters, up to but not including the final "}". Finally PAD appends the original first parameter. The result is that environment variable {N} contains the original string right-justified within the padding string.

You can use this same technique any time you need to process each character of a string separately. For example, REVERSE.BAT (Figure 4) splits its first parameter into separate characters and builds an environment variable containing the parameter in reverse.

You can download all the files mentioned here from PC Magazine Online. See page 12 for details.

```
:: REVERSE.BAT - reverse string
:: passed as first parameter;
:: limited to about 57 characters
@ECHO OFF
IF '%1'=='!' GOTO REENTER
> {T}.BAT ECHO:; | CHOICE/C=%1; %0 |
{T}
:REENTER
DEL {T}.BAT
SET R=
:LOOP
SHIFT
SET R=%1%R%
IF NOT '%2'==' ' IF NOT '%2'==' '
IF NOT '%2'==' ' GOTO Loop
ECHO %R%
```

FIGURE 4: REVERSE.BAT demonstrates another way to use the technique of splitting a string into separate characters with CHOICE.

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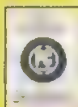
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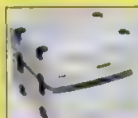
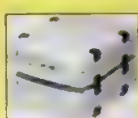
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HARDWARE

The Joy of Game Ports



Although I have a built-in game port on my computer, I recently purchased a sound card that has a game port as well. When I asked the sound card company if I could use two joysticks at once, they told me I had to disable the game port on my motherboard and use a Y-cable with the sound card port. Will this work? How does the port distinguish between joysticks?

DEREK ALTAMIRANO,
Colville, Washington

PC MAGAZINE: Most—but not all—game ports can handle two joysticks without any problems, but your computer is certain to be confused by the presence of two game ports. The advice you received from the sound card company is correct.

You'll have to consult your computer's documentation (or contact the manufacturer) to disable your motherboard port. Some computers use a physical jumper on the motherboard to control the port, while others let you

turn it on and off using the CMOS-configuration setup utility. Once you have eliminated the conflict caused by two game ports in one system, you're ready to hook up a pair of joysticks using a Y-cable. To understand how this works, you must know a bit about how joysticks are designed.

In the digital, binary world of the microcomputer, joysticks are a bit of an anomaly: They're analog-based. Each joystick has two axes. The signal from each axis is produced by running a current through a potentiometer, a variable resistor that blocks part of the electrical current. The amount of current reaching the other end of the cable provides a value that the computer uses to calculate the joystick's position. In addition to the two potentiometer circuits, each joystick has a pair of switches, referred to colloquially as fire buttons.

With a voltage input, two potentiometers, two switched lines, and an electrical ground, a single joystick needs only six wires. The standard game port connector has 15 pins, which is more than enough to serve two joysticks. The pin assignments for a standard game port are as follows:

Pin	Assignment
1	+5 VDC
2	Joystick 1 Fire 1
3	Joystick 1 X Axis
4	ground
5	ground
6	Joystick 1 Y Axis
7	Joystick 1 Fire 2
8	+5 VDC
9	+5 VDC
10	Joystick 2 Fire 1
11	Joystick 2 X Axis
12	ground
13	Joystick 2 Y Axis
14	Joystick 2 Fire 2
15	+5 VDC

To hook up a second joystick, all you have to do is use a Y-cable that connects pins 10 through 14 (the Joystick 2 connections) to the corresponding pins 2 through 7 for the standard Joystick 1 assignments. This gives each joystick its own set of signal connections.

Recently, pedals have become a popular accessory for driving and flying simulation programs. A splitter connection is typically built right into the cable, so no extra cable is required to connect a joystick or flight yoke.

Some inexpensive game port cards—especially those with two separate connectors—

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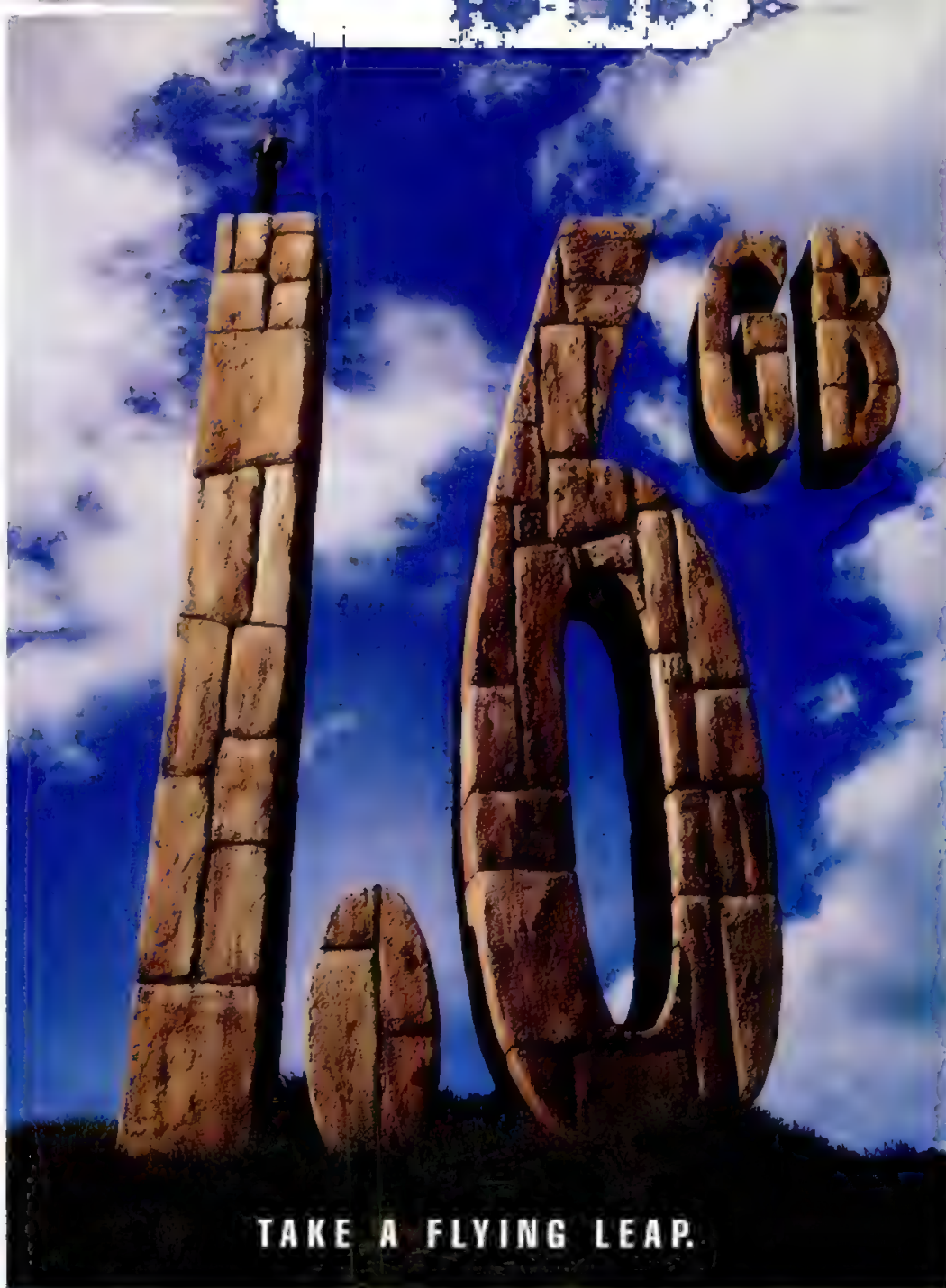
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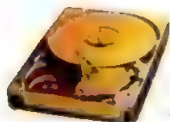
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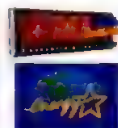


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Quantum								
1280MB	12ms	3.5" 1"H	Fast-ATA-2	128	5,400	QUFB1280A	\$269	\$319*
Maxtor								
1620MB	11ms	3.5" 1"H	Enhanced IDE	256	4,500	MX71626A	\$359	\$409*
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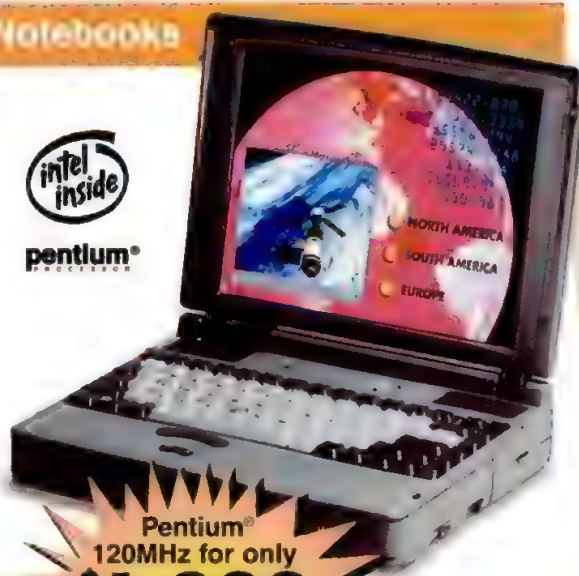
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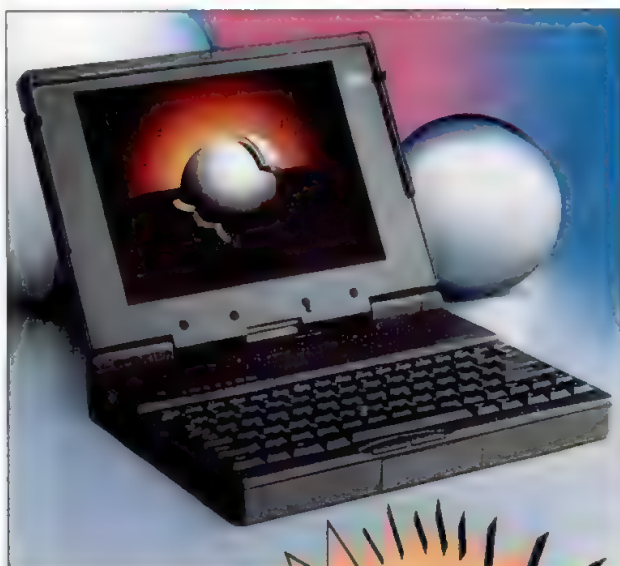
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may not provide the Joystick 2 signals on the Joystick 1 connector. Such ports will not work with pedal controls or any other cabling arrangement in which both joysticks plug into a single game port connection.

If you're not sure whether your joysticks are working correctly, you probably don't need to get an extra diagnostics program to test your installation; Microsoft Diagnostics (MSD.EXE) will do the job just fine. If your game port is correctly configured, it will show up on the main MSD screen at the lower left, next to the Other Adapters heading. If you press A, a window will appear showing the current values for the positions and fire buttons of both joysticks. This display is not interactive; it is a snapshot of the values at the time that you pressed A. Press Enter to close the window, then move the joystick or hold down a fire button and press A again. By comparing the values displayed in the window with previous trials, you can determine whether or not your joystick and game port are working.—*Alfred Poor*

Upgrading Processors

I would like to upgrade my computer's 486DX/33 processor, but it doesn't have an Overdrive socket. Can I just replace the CPU with a 486DX/66 using the same socket? Will I see much of a performance improvement?

PACHTER YEOSHUA, Tel Aviv, Israel

PC MAGAZINE: A CPU swap is a relatively inexpensive upgrade that can yield an impressive performance boost, provided that the rest of your system is up to the task.

Many motherboards can accept a 486DX2/66 in place of a 486DX/33 without changing a thing. Do, however, check your motherboard documentation for any jumper changes that might be required. Since some motherboards are not compatible with a DX2/66 CPU, you should also check with your system's manufacturer or Intel before buying the replacement chip if you have any question about compatibility. You can also use a DX4/100 CPU in most cases for even better performance. Since these processors only speed up calculations performed within the CPU, however, the performance gain is most evident with applications that are processor-intensive.

If you're dropping one of these new CPUs into an old AT-clone ISA bus machine, you might want to consider a motherboard upgrade as well. You miss out on a major performance boost if you don't take advantage of local bus connections for your graphics adapter and hard disk. VL-Buses are usually paired with 486 processors, but you should opt for a PCI bus for both 486s and Pentiums since many top graphics card and hard disk drive controller manufacturers no longer make VL products.—*Alfred Poor*

OPERATING ENVIRONMENTS

The Return of the Invisible Icon



In the Solutions column of May 16, 1995, you indicated that "For an ordinary program, all you'd have to do is edit the Program Properties in Program Manager to use the invisible icon." Based on my experience, though, this changes the icon only as it appears in Program Manager; the application's normal icon appears when the program is minimized. Is there a way to replace the icon an application uses when it is minimized?

JOHN ELFTMANN, Omaha, Nebraska

PC MAGAZINE: Yes, it is possible. Your confusion is understandable, since there is a false implication in the sentence you quote—it seems to say that you can change the icon for any application in the same way. But as you mention, Program Manager is a special case. When you place a Program Manager item in the Startup group, it uses that icon when minimized. DOS-based programs also use their Program Manager-assigned icons when minimized. But assigning an icon to a regular Windows application in Program Manager affects only the icon that is displayed in Program Manager. When minimized, the application will use its own icon. Thus this is not a procedure that you can apply to Windows applications in general. To change the icon a Windows application will use when minimized, you'd have to edit the .EXE file itself using a resource editor such as Borland's Resource Workshop. Even then, success is not guaranteed, since a Windows program is free to completely take over the process of displaying its own icon.

While we're on the subject of the invisible icon item, let me clarify for any readers who were befuddled that the fourth line of the original DEBUG script was "F 100 L C6 0". Since the line was printed in lowercase, it was not clear that the character after 100 was an L, not the digit 1.—*Neil J. Rubenking*

WORD PROCESSING

Heading Numbering Schemes in Word



The Heading Numbering option in Microsoft Word for Windows (choose Format | Heading Numbering) lets you automatically number various sections of a document, then renumber those sections as you add, delete, or move them. It does not, however, allow you to change numbering schemes in the middle of a document. You cannot, for instance, have one scheme for chapters

(1, 2, 3, and so on) and a separate scheme for appendixes (A, B, C, and so on).

If you modify the numbering scheme at a given point in a document, Word changes the headings for the entire file—even if you highlight the specific portion of the document you wish to change. Microsoft technical support claims that the only solution is to put the chapters and appendixes in two separate files. Is there a way to keep the entire document in one file and still have the two automatic numbering schemes?

D. LAU, Santa Clara, California

PC MAGAZINE: Unfortunately, Microsoft support is correct. You can't even change numbering schemes in mid-document under Windows 95 and Word 7.0. A Heading Numbering scheme not only blankets the entire file in which it was set, but it is specific to that file as well; if you add a numbering scheme to

You miss out on a major performance boost if you don't take advantage of local bus connections for your graphics adapter and hard disk.

a file and insert that file into another (using the Insert | File command or an IncludeText field), the scheme will not show up in the second file. Thus, you can't set a different scheme in two separate files and then paste them together. You can't even apply separate schemes to subdocuments that reside in a master document.

There is a workaround, however, that lets you write your document within one file and then automatically separate it into files with different numbering schemes. Before you begin writing, create an empty file for your numbered chapters and an empty file for your appendixes. Make sure that the chapter file ends with a page break (Ctrl-Enter) and set the appropriate heading numbering for both files. Next, create a third document that contains only a pair of IncludeText fields and an end-of-file marker (Return). One IncludeText field should link to your chapter file and the other to your appendix file:

```
{INCLUDETEXT drive:\\path\\filename
-\\* MERGEFORMAT}
```

The best way to insert each field is to hit Ctrl-F9, which will give you the braces (Word

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refers to them as field characters), and then type the text that goes between those braces. Note that these are not the braces you can type directly from the keyboard. Once you add an end-of-file marker to the file, move to the View tab under Tools | Options and make sure that the Field Codes box is not checked.

Next, select both fields and hit F9 to update them; because the Field Codes box is not checked, Word immediately replaces the field codes with the field results—which, in this case, are your two other files. At this point, you can edit either field result, just as if you were working in the original files. When you have finished writing the chapters and the appendixes within their respective fields, select the entire file with Ctrl-F5, then use Ctrl-Shift-F7 to export the fields to your original files. You can then print each file separately to obtain the different numbering schemes. (Don't forget to adjust the starting page numbers in the appendixes file if you want continuous page numbering.)

If you use this workaround, don't enter anything outside of the IncludeText fields; only text within one of the two fields will be saved to the printed files. You can check for misplaced text by selecting Tools | Options and choosing View. The resulting dialog offers three Field Shading options that tell the system when to shade field text: Always, Never, or When Selected. If you set this feature to Always or When Selected, you can easily spot text that is not within a field. If you choose Never, you can use Alt-F9 to view the field codes (hitting Alt-F9 again returns to field results); any text still present is clearly not part of a field.

If you find text that is outside the fields,

simply highlight it, return to the field results if you are viewing the field codes, and use Word's usual editing tools to move the text inside the correct field result. Finally, press Ctrl-Shift-F7 again to update the original files.

—M. David Stone.

DATABASES

Fast Getaway for Access



It's easy to create a button to exit Microsoft Access—the Button Wizard will set that up for you. But what about exiting both Access and Windows at the same time? Many of my users stay in one Access application all day long. When they leave for the day, they need to shut down both Access and Windows so they can turn off the computer. You can do this by calling a Windows API function, as shown in my sample functions (see Figure 1).

ROB MCCORMACK,
Thunder Bay, Ontario, Canada

PC MAGAZINE: How you do this depends on what version of Access you use. If you're running Access 2.0, which is designed to run on 16-bit operating systems like Windows 3.1, you can make calls only to functions that are part of the 16-bit Windows API. One of those functions is the ExitWindows function used in Mr. McCormack's original code. If you're running Access 7.0 for Windows 95, you need a different set of functions, which I'll discuss in a moment.

Because you can use the ExitWindows function to do three different things, I

changed Mr. McCormack's code to divide his original function into the three functions shown in Figure 1. Each one corresponds to one of the options allowed by the ExitWindows function: one to terminate Windows, one to terminate and then restart Windows, and one to terminate Windows and reboot your computer.

When you call ExitWindows, Windows sends a message to all open applications notifying them that a request has been made to close Windows. If you've made any changes in any open applications, this is the point at which they'll ask if you want to save your changes. All open applications must agree to be terminated, or ExitWindows will fail.

You pass ExitWindows one of the three global constants shown in Figure 1 to indicate whether you want to terminate Windows, restart Windows, or reboot the computer. The second argument to the ExitWindows API function is reserved and must always be 0.

If you're running Access 7.0 for Windows 95, a version designed to run on 32-bit operating systems like Windows 95 and Windows NT, you can make calls only to functions contained in the 32-bit Windows API. Thus you can't use the functions shown in Figure 1, because they're designed for 16-bit Windows. Instead, you have to use the functions shown in Figure 2.

These functions use ExitWindowsEx, the Win32 API function necessary if you're running Access 95. To use ExitWindowsEx, you pass it some combination of the five public constants shown in Figure 2 to indicate which option you want. You can specify a single constant, like EWX_SHUTDOWN, or a series of constants added together, like EWX_SHUT-

```
Option Compare Database 'Use database order for string
                          'comparisons
```

```
Option Explicit
```

```
Declare Function ExitWindows Lib "User" (ByVal
dwReturnCode As Long, ByVal uReserved As Integer) As
Integer
```

```
Global Const EW_REBOOTSYSTEM = &H43
```

```
Global Const EW_RESTARTWINDOWS = &H42
```

```
Global Const EW_EXITWINDOWS = 0
```

```
*****
' Function Exitwin ()                      Access 2.0
' Function to exit Windows, 16-bit.
*****
```

```
Function Exitwin () As Integer
Dim intRetVal As Integer
intRetVal = ExitWindows(EW_EXITWINDOWS, 0)
Exitwin = intRetVal
End Function
```

```
*****
' Function ExitWinReboot()                Access 2.0
' Exit Windows and reboot the computer - 16 bit.
*****
```

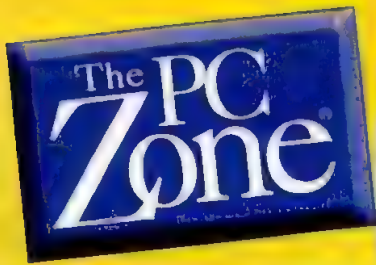
```
Function ExitWinReboot () As Integer
Dim intRetVal As Integer
intRetVal = ExitWindows(EW_REBOOTSYSTEM, 0)
ExitWinReboot = intRetVal
End Function
```

```
*****
' Function ExitWinRestart ()              Access 2.0
' Exit Windows and Restart Windows - 16 bit.
*****
```

```
Function ExitWinRestart () As Integer
Dim intRetVal As Integer
intRetVal = ExitWindows(EW_RESTARTWINDOWS, 0)
ExitWinRestart = intRetVal
End Function
```

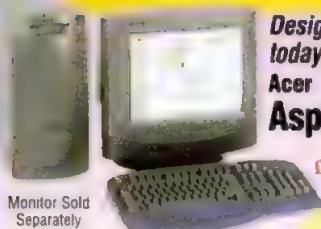
FIGURE 1: You can use the functions shown here to exit Windows directly from your Microsoft Access 2.0 applications.





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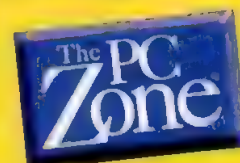
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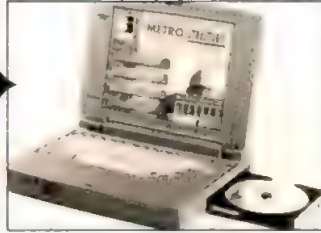
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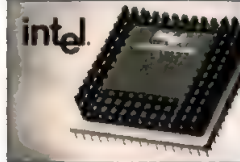
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CIRCLE 089 ON READER SERVICE CARD

Option Compare Database 'Use database order for string
comparisons

Option Explicit

Declare Function ExitWindowsEx Lib "user32" (ByVal uFlags
As Long, ByVal dwReserved As Long) As Long

Public Const EWX_LOGOFF = 0
Public Const EWX_SHUTDOWN = 1
Public Const EWX_REBOOT = 2
Public Const EWX_FORCE = 4
Public Const EWX_POWEROFF = 8

```
*****
' Public Function ExitWinLogoff()                VBA
' VBA function to call WIN32 API to exit
' Windows with LOGOFF option.
' Shuts down all processes running
' in the security context of the
' process that called the ExitWindowsEx
' function. Then it logs the
' user off.
```

```
*****
Public Function ExitWinLogoff() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_LOGOFF, 0)
ExitWinLogoff = lngRetVal
End Function
```

```
*****
' Public Function ExitWinLogoffForce()           VBA
' VBA function to call WIN32 API to
' exit Windows with LOGOFF and
' FORCE options. Instead of bringing
' up the "application not
' responding" dialog box for the
' user, this function forces an
' application to terminate if it
' does not respond. Shuts down all
' processes running in the security
' context of the process that called
' the ExitWindowsEx function.
' Then it logs the user off.
```

```
*****
Public Function ExitWinLogoffForce() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_LOGOFF + EWX_FORCE, 0)
ExitWinLogoffForce = lngRetVal
End Function
```

```
*****
' Public Function ExitWinPoweroff()             VBA
' VBA function to call WIN32 API to
' exit Windows with POWEROFF option.
' Shuts down the system and turns
' off the power. The application
' must have the SE_SHUTDOWN_NAME
' privilege and the system must
' support the power off feature.
```

```
*****
Public Function ExitWinPoweroff() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_POWEROFF, 0)
ExitWinPoweroff = lngRetVal
End Function
```

```
*****
' Public Function ExitWinPoweroffForce()         VBA
' VBA function to call WIN32 API to exit
' Windows with POWEROFF and FORCE
' options. Instead of
' bringing up the "application not
' responding" dialog box for the user,
' this function forces an
' application to terminate if it does not
' respond. Shuts down the system and
' turns off the power. The application must
' have the SE_SHUTDOWN_NAME privilege and
' the system must support the power off feature.
```

```
*****
Public Function ExitWinPoweroffForce() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_POWEROFF + EWX_FORCE, 0)
ExitWinPoweroffForce = lngRetVal
End Function
```

```
*****
' Public Function ExitWinReboot()               VBA
' VBA function to call WIN32 API to exit
' Windows with REBOOT option.
' Shuts down the system and then reboots
' the computer. The application must have the
' SE_SHUTDOWN_NAME privilege.
```

```
*****
Public Function ExitWinReboot() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_REBOOT, 0)
ExitWinReboot = lngRetVal
End Function
```

```
*****
' Public Function ExitWinRebootForce()          VBA
' VBA function to call WIN32 API to exit
' Windows with REBOOT and FORCE options.
' Instead of bringing up the "application
' not responding" dialog box for the user,
' this function forces an application to terminate
' if it does not respond. Shuts down the
' system and then reboots the computer. The
' application must have the SE_SHUTDOWN_NAME privilege.
```

```
*****
```



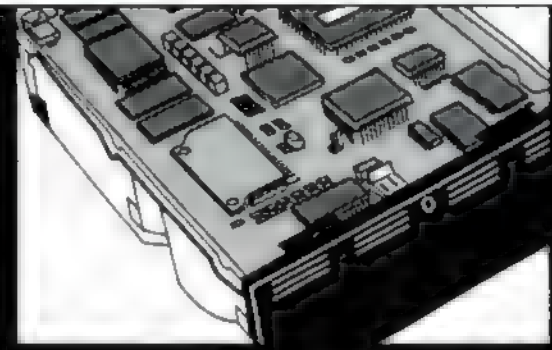
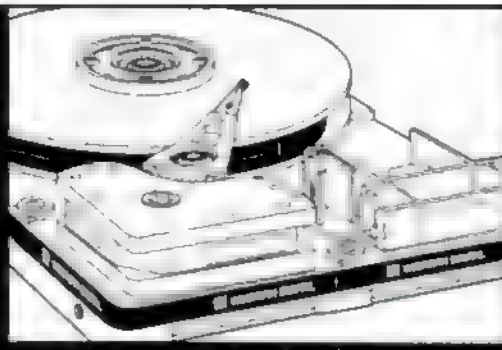
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FIGURE 2: You can use the functions shown here to exit Windows directly from your Microsoft Access for Windows 95 applications.

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```
Public Function ExitWinRebootForce() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_REBOOT + EWX_FORCE, 0)
ExitWinRebootForce = lngRetVal
End Function
```

```
*****
' Public Function ExitWinShutdown()                VBA
' VBA function to call WIN32 API to
' exit Windows with SHUTDOWN option.
' Shuts down the system to a point
' at which it is safe to turn off the
' power. All file buffers have been
' flushed to disk, and all running
' processes have stopped. The application
' must have the SE_SHUTDOWN_NAME privilege.
*****
Public Function ExitWinShutdown() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_SHUTDOWN, 0)
ExitWinShutdown = lngRetVal
End Function
```

```
*****
' Public Function ExitWinShutdownForce()          VBA
' VBA function to call WIN32 API to
' exit Windows with SHUTDOWN and
' FORCE options. Instead of bringing
' up the "application not responding"
' dialog box for the user, this function
' forces an application to terminate if
' it does not respond. Shuts down the
' system to a point at which it is
' safe to turn off the power. All file
' buffers have been flushed to disk,
' and all running processes have stopped.
' The application must have the
' SE_SHUTDOWN_NAME privilege.
*****
Public Function ExitWinShutdownForce() As Long
Dim lngRetVal As Long
lngRetVal = ExitWindowsEx(EWX_SHUTDOWN + EWX_FORCE, 0)
ExitWinShutdownForce = lngRetVal
End Function
```

FIGURE 2 (CONT.)

DOWN + EWX_FORCE. The second argument to the ExitWindowsEx API function is reserved and ignored by Windows.

The functions shown in Figure 2 correspond to eight possible combinations of the options supported by ExitWindowsEx:

- The first, ExitWinLogoff, shuts down all your applications and logs you off. For example, if you're running Windows 95 and you have any type of network installed, you'll see the Login dialog after ExitWinLogoff completes.
- The second, ExitWinLogoffForce, shuts down all your applications and logs you off, even if your open applications don't respond to Windows shut-down notification messages. Normally Windows will display an "Application not responding" message if a running program fails to respond to the shut-down notification, and the call to ExitWinLogoff fails. With ExitWinLogoffForce, applications that don't respond are terminated anyway.
- The third function, ExitWinPoweroff, shuts down Windows and turns off the power, provided that your computer supports this feature.
- ExitWinPoweroffForce, the fourth function, adds the FORCE option to ExitWinPoweroff.
- The fifth function, ExitWinReboot, shuts down Windows and reboots your computer.
- ExitWinRebootForce, the sixth function, adds the FORCE option to ExitWinReboot.
- The seventh function, ExitWinShutdown, shuts down the system to the point where you can safely turn off the power. If you're running Windows 95, for example, you'll eventually see the "It's now safe to turn off your computer" message.

- The last function, ExitWinShutdownForce, adds the FORCE option to ExitWinShutdown.

You will notice that it doesn't make sense to combine some of the options to ExitWindowsEx. For example, EWX_POWEROFF + EWX_REBOOT seems contradictory. And because the EWX_LOGOFF constant is 0, it's really included in every call to ExitWindowsEx.

If you're running the Windows NT operating system, you must have the SE_SHUTDOWN_NAME security privilege to use the EWX_POWEROFF, EWX_REBOOT, or EWX_SHUTDOWN options with ExitWindowsEx. For more information, see the descriptions of the ExitWindowsEx function in the Win32 SDK.

You can call any of the functions in Figures 1 and 2 directly from a command button on a Form. For example, to call the ExitWinShutdown function from a command button, just enter

```
=ExitWinShutdown()
```

in the button's On Click property.

If you'd rather have an Access macro perform the work, you can easily do so. Why would you want to create a macro? One reason is that custom toolbar buttons can only call macros, so if you want to create a toolbar button to call one of the functions in Figures 1 or 2, you have to create a macro to call the function.

To create an Access macro to call the ExitWinShutdown function, open your database, select the Macros tab in the database container, and then choose New. In the Action col-

umn, select the first empty cell, click on the arrow, and choose the RunCode macro action. Next, type "Shut down Windows" in the Comment column. Then place the insertion point in the Function Name text box at the bottom of the screen and type

```
ExitWinShutdown()
```

Next, select the File menu, choose Save As, and name the resulting macro ExitWinShutdown.

You can download the code in Figures 1 and 2 from PC Magazine Online (see page 12 for instructions). Look for the files EXWIN.AB and EXWINX.AB.—*Sal Ricciardi*

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TEAC 4X, 8X EIDE K2 \$258
Toshiba 4X, 8X EIDE K1 \$226
Toshiba 4X, 8X EIDE K2 \$344/\$412
Nec 4X, 8X EIDE K1 \$469/\$563
Pioneer 4X, 8X EIDE K1 \$412/\$518

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Back UPS Pro 650, Wt. 95 \$294

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Vista-SB PCI 800 600dpi 24-bit-color 1bit w/ w/ \$668
UCI 280 PCI 800 600dpi 24-bit-color 1bit w/ w/ \$737
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HEWLETT-PACKARD
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INTEL
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Etherexpress pro 10 100 100T, 100T, 100T, 100T \$117
Etherexpress pro 10 100 100T, 100T, 100T, 100T \$141
Etherexpress pro 10 100 100T, 100T, 100T, 100T \$186
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Etherstar 450T 486DX4/75 4MB, 9.5" Active, 340MB \$2052
Etherstar 550 Pentium/75 8MB, 10.4" DS, 540MB \$2443
Etherstar 550CT Pentium/75 8MB, 10.4" Active, 540MB \$2921
Etherstar 550CT Pentium/75 8MB, 10.4" Active, 540MB \$2921
T45000 Pentium/75 8MB, 10.4" DS, 500MB \$2734
T45000 Pentium/75 8MB, 10.4" Active, 720MB \$3459
T45100 Pentium/90 8MB, 10.4" Active, 1 2GB \$4211
T45200 Pentium/120 8MB, 10.4" Active, 1 2GB \$5081

NEC
Versa 20000 486DX4/75 4MB, 10.4" DS, 350MB \$1860
Versa 2000C 486DX4/75 4MB, 9.5" Active, 350MB \$2139
Versa 2000C 486DX4/75 8MB, 9.5" Active, 350MB \$2418
Versa 2000C 486DX4/75 8MB, 10.4" Active, 340MB \$2604
Versa 4000 Pentium/75 8MB, 10.4" DS, 540MB \$3355
Versa 4000C Pentium/75 8MB, 10.4" Active, 540MB \$3576
Versa 4000C Pentium/75 8MB, 10.4" Active, 540MB \$3720
Versa 4000C Pentium/75 8MB, 10.4" Active, 540MB \$4427
Versa 4000C Pentium/75 8MB, 10.4" Active, 540MB \$4570

IBM
ThinkPad 701CS 486DX4/75 8MB, 10.4" DS, 360MB \$2721
ThinkPad 701C 486DX4/75 8MB, 10.4" Active, 360MB \$3174
ThinkPad 755CD Pentium/75 8MB, 10.4" Active, 510MB \$4712
ThinkPad 760C Pentium/90 8MB, 10.4" Active, 810MB \$5192

AST
Ascario 950H Pentium/75 8MB, 10.4" DS, 300MB \$2804
Ascario 950H Pentium/75 8MB, 10.4" Active, 300MB \$3767
Ascario 950H Pentium/90 8MB, 10.4" DS, 800MB \$3209
Ascario 950H Pentium/90 8MB, 10.4" Active, 800MB \$4140

ZENITH
Zenith MX Pentium/75 8MB, 10.4" DS, 420MB \$2579
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8/500MB Dual
\$2635 \$2600

	ELP	BCP
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950N Pentium® 75 8/1200MB Dual	3280	3250
950N Pentium® 90 8/600MB Dual	3280	3250
950N Pentium® 75 8/1200MB Dual	3635	3600
950N Pentium® 75 8/1200MB Active	4240	4200
950N Pentium® 90 8/1200MB Active	4590	4550

IBM

701CS 4/75 8/540MB Active	\$3335	\$3300
701C 4/75 8/540MB Active	3890	3850
755CX Pentium® 75 8/540MB Active	4690	4650
755CX Pentium® 75 8/810MB Active	5040	5000
755CD Pentium® 75 8/810MB CD Act.	5240	5200
760C Pentium® 120 8/720MB 12.1" Act.	6440	6400
760CD Pentium® 90 8/1200MB 12.1" Act.	7250	7200

NEC

2000D 4/75 4/350MB Dual	\$1905	\$1880
2000C 4/75 4/350MB Active	2175	2150
2000C 4/75 8/540MB Active	2650	2630
4000D Pentium® 75 8/540MB Dual	3330	3300
4000D Pentium® 75 8/540MB/CD Dual	3640	3600
4050CD Pentium® 90 8/810MB/CD Act.	4550	4500
4080H Pentium® 120 8/1000MB Active	5350	5300



Externa 450 DX4/75 4/340MB Dual	\$1770	\$1730
Externa 590 P/75 8/524MB Dual	2430	2400
Externa 590CD P/75 8/524MB/CD Dual	2910	2880
Externa 590CDT P/75 8/524MB/CD Act.	3490	3450
TM5100 Pentium® 90 8/1200MB Active	4650	4600
TM5200 Pentium® 120 8/1200MB Active	5050	5000

TOSHIBA

T2110CS 4/75 4/330MB Dual	\$1699	\$1679
T2130CS 4/75 8/500MB Dual	1999	1979
T400CS Pentium® 75 8/810MB Dual	2999	2949
T410CS Pentium® 90 8/810MB Dual	3530	3499
T400CDT P/75 8/810MB/CD Active	3999	3949
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T700CS Pentium® 120 8/1200MB Dual	4650	4600
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CREATIVE
Multimedia Kit
8000
\$555 \$540

	ELP	BCP
Multimedia Kit 7000	\$360	\$350

CREATIVE

Sound Blaster AWE32 PNP	\$225	\$215
Discovery CD 4X Internal	325	315
Blaster CD 4X IDE Internal	180	175

NEC

6XE External 6X Speed	\$550	\$550
6XI Internal 6X Speed	450	440



6PLEX Internal 6X Speed w/Controller	\$490	\$480
6PLEX Internal 6X Speed w/o Controller	445	435

MONITORS



ViewSonic
17GA Multimedia
.27mm 1280 x 1024
\$825 \$816

	ELP	BCP
15E5 15" .28mm	\$380	\$370
15GA 15" .27mm	500	490
17GS 17" .27mm	755	745
20G 20" .28mm	1260	125
21PS 21" .25mm	1750	1730

CTX

1565D 15" .28mm	\$359	\$349
1765GMe 17" .27mm	655	640
1785GMe 17" .27mm	715	700
2085 20" .28mm	1125	1100



DX15F 15" .28mm	\$390	\$375
DX17F 17" .26mm	695	670



Diamond Scan 15HX 15" .28mm	\$440	\$420
1765GMe 17" .27mm	905	860
Diamond Pro 17TX 17" .25mm	1050	1030
Diamond Pro 21TX 21" .30mm	1880	1850

NEC

MultiSync XV15 15" .28mm	\$470	\$450
MultiSync XV17 17" .28mm	740	730
MultiSync XP17 17" .28mm	1050	1030
MultiSync XE21 21" .28mm	1800	1780
MultiSync XP21 21" .28mm	2170	2150

Panasonic

PanaSync C1591E 15" .27mm	\$425	\$415
PanaSync C1791E 17" .27mm	750	740
PanaMedia 17 17" .27mm	805	790
PanaSync Pro C2192P 21" .25mm	1750	1730

SONY

CPD-1425 14" .25mm	\$300	\$292
Multiscan 15af 15" .25mm	475	465
Multiscan 17af 17" .27mm	870	850
Multiscan 20e 20" .30mm	1920	1900

VIDEO CARDS



matrox
MGA Millennium
2MB PCI MPEG
\$310 \$294

	ELP	BCP
Graphics Xpression 1MB ISA	\$140	\$132
Graphics Xpression 2MB VLB	185	176
WinTurbo 2MB PCI	263	253
Graphics Pro Turbo 2MB PCI	310	298
Graphics Pro Turbo 4MB PCI	430	420

SIEMENS

Speedstar Pro 1MB VLB DRAM	\$95	\$86
Seastar 64 2MB VLB VRAM	330	320
Seastar 64 4MB PCI VRAM	475	465
Seastar Video 2MB DRAM PCI	224	214



9FX Vision 330 2MB PCI	\$174	\$166
9FX Motion 531 2MB PCI	217	207
9FX Motion 771 4MB PCI	425	415

PRINTERS



EPSON
Stylus Color II Inkjet
720 dpi color
\$315 \$310

	ELP	BCP
Stylus Color IIs	\$315	\$310
Stylus Color Pro	\$755	\$735

Canon

BJC-4100 Color Inkjet	\$365	\$355
BJC-610 Color Inkjet	545	535
LBP-460 600DPI	380	370
LBP-1260 600DPI	1285	1265
MultiPASS 1000 Multifunction	700	685



DeskJet 600 Inkjet	\$295	\$288
DeskJet 660C Color Inkjet	395	385
DeskJet 850C Color Inkjet	530	519
LaserJet 5L 600DPI	510	495
LaserJet 5P 600DPI	859	845
LaserJet 5MP 600DPI	1025	1000

LEXMARK

Opera R+ 1200DPI	\$1440	\$1420
Opera R+ 1200DPI	1630	1600
Opera Lx+ 1200DPI	2225	2200
Opera Lx+ 1200DPI	2920	2880
Medley 4C 300DPI Multifunction	685	670

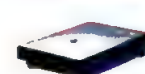
OKIDATA

OKIJET 2010 Color Inkjet	\$365	\$355
OL600e 600DPI	395	385
OL610e 600DPI	500	485
OL810e 600DPI	765	745



MicroLaser WIN/4 600DPI	\$435	\$414
MicroLaser 600 600DPI	830	800
MicroLaser Pro E 600DPI	1320	1300
MicroLaser Power Pro 600DPI	1600	1550

SCANNERS



HEWLETT-PACKARD
ScanJet 4C Flatbed
600 dpi Color
\$930 \$910

EPSON

	ELP	BCP
ES-600C Color Flatbed	\$500	\$490
ES-1000C Color Flatbed	725	710
ES-1200C Color Flatbed	930	915
ES-1200C Pro Color Flatbed	1100	1080

MICROTEK

ScanMaker II Color Flatbed	\$365	\$355
ScanMaker IIS Color Flatbed	450	440
ScanMaker IIHR Color Flatbed	545	530
ScanMaker 35T Color Slide	675	640
ScanMaker III Color Flatbed	1930	1900

UMAX

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Vista-S8 PCLE2	645	630
PowerLook PCPRO2	2000	1980

MODEMS



Sportster 28.8
V.34 Data/Fax Ext.
\$200 \$192

	ELP	BCP
Sportster SI 14.4/Fax	\$355	\$346
Sportster 28.8 V.34 Data/Fax Internal	185	175
Sportster 28.8/Fax PCMCIA	274	264

CARDINAL

MVP 28.8/V Int. Voice/Fax/Modem	\$160	\$154
MVP 28.8/V Ext. Voice/Fax/Modem	174	172



Accura 144B+ FAX/144 Internal	\$95	\$89
Accura 144+ FAX/144 External	110	104
Accura 288 V.34/VFC+ FAX Internal	185	176
Accura 288 V.34/VFC+ FAX External	215	208



PM144HC II 14.4/Fax	\$74	\$70
PM144MT II 14.4/Fax	90	86
PM288HC II V.34 28.8/Fax	165	158
PM288MT II V.34 28.8/Fax	185	177
PC288 28.8/Fax PCMCIA	274	264

MASS STORAGE



WESTERN DIGITAL
Caviar
1083MB EIDE
\$243 \$235

	ELP	BCP
Caviar 635MB EIDE	\$183	\$175
Caviar 850MB EIDE	210	199
Caviar 1280MB EIDE	290	280



Filepro 635MB EIDE	\$190	\$182
Filepro 850MB EIDE	205	198
Filepro 1275MB EIDE	264	254



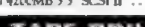
Fireball 1080MB EIDE	\$235	\$227
Fireball 1280MB EIDE	250	244
TrailBlazer 850MB EIDE	199	193
TrailBlazer 850MB SCSI-2	229	222



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Datto 3200MB External	370	360



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286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

Individual D-RAM Chips

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

INTEL Math Chips

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

CYRIX DRx 386 to 486 Upgrade

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

SIMM MODULES (Add \$5.00 for SIPP)

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

72 PIN SIMMS (EISA, EDO) DIMMS (168 pin, 64 bit)

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

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AST MEMORY

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

AMIRA

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

MAGNAVOX

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

ZENITH MEMORY MODULES

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

H.P. COMPATIBLE FONT CARTRIDGE

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

BOCA XT 8 BIT BUS

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

IBM P/52 32BIT EXPANSION Bd.

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

PS/2 MCA 0-8MEG EXPANSION Bd.

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

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Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

IBM NOTEBOOK & LAPTOP MEMORY

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

COMPAQ MEMORY MODULES

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

COMPAQ LAPTOPS & NOTEBOOKS

Model	128K	192K	256K	384K
80486	128K	192K	256K	384K
286	128K	192K	256K	384K
386	128K	192K	256K	384K
486	128K	192K	256K	384K
586	128K	192K	256K	384K
686	128K	192K	256K	384K
786	128K	192K	256K	384K
886	128K	192K	256K	384K
986	128K	192K	256K	384K

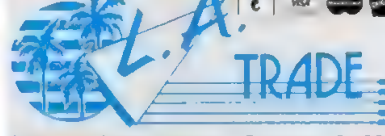
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386 128K 192K 256K 384K	586/686	686	PC-83200/160	180
486 128K 192K 256K 384K	686	686	PC-83200/160	180
586 128K 192K 256K 384K	686	686	PC-83200/160	180
686 128K 192K 256K 384K	686	686	PC-83200/160	180
786 128K 192K 256K 384K	686	686	PC-83200/160	180
886 128K 192K 256K 384K	686	686	PC-83200/160	180
986 128K 192K 256K 384K	686	686	PC-83200/160	180
1086 128K 192K 256K 384K	686	686	PC-83200/160	180
1186 128K 192K 256K 384K	686	686	PC-83200/160	180
1286 128K 192K 256K 384K	686	686	PC-83200/160	180
1386 128K 192K 256K 384K	686	686	PC-83200/160	180
1486 128K 192K 256K 384K	686	686	PC-83200/160	180
1586 128K 192K 256K 384K	686	686	PC-83200/160	180
1686 128K 192K 256K 384K	686	686	PC-83200/160	180
1786 128K 192K 256K 384K	686	686	PC-83200/160	180
1886 128K 192K 256K 384K	686	686	PC-83200/160	180
1986 128K 192K 256K 384K	686	686	PC-83200/160	180
2086 128K 192K 256K 384K	686	686	PC-83200/160	180
2186 128K 192K 256K 384K	686	686	PC-83200/160	180
2286 128K 192K 256K 384K	686	686	PC-83200/160	180
2386 128K 192K 256K 384K	686	686	PC-83200/160	180
2486 128K 192K 256K 384K	686	686	PC-83200/160	180
2586 128K 192K 256K 384K	686	686	PC-83200/160	180
2686 128K 192K 256K 384K	686	686	PC-83200/160	180
2786 128K 192K 256K 384K	686	686	PC-83200/160	180
2886 128K 192K 256K 384K	686	686	PC-83200/160	180
2986 128K 192K 256K 384K	686	686	PC-83200/160	180
3086 128K 192K 256K 384K	686	686	PC-83200/160	180
3186 128K 192K 256K 384K	686	686	PC-83200/160	180
3286 128K 192K 256K 384K	686	686	PC-83200/160	180
3386 128K 192K 256K 384K	686	686	PC-83200/160	180
3486 128K 192K 256K 384K	686	686	PC-83200/160	180
3586 128K 192K 256K 384K	686	686	PC-83200/160	180
3686 128K 192K 256K 384K	686	686	PC-83200/160	180
3786 128K 192K 256K 384K	686	686	PC-83200/160	180
3886 128K 192K 256K 384K	686	686	PC-83200/160	180
3986 128K 192K 256K 384K	686	686	PC-83200/160	180
4086 128K 192K 256K 384K	686	686	PC-83200/160	180
4186 128K 192K 256K 384K	686	686	PC-83200/160	180
4286 128K 192K 256K 384K	686	686	PC-83200/160	180
4386 128K 192K 256K 384K	686	686	PC-83200/160	180
4486 128K 192K 256K 384K	686	686	PC-83200/160	180
4586 128K 192K 256K 384K	686	686	PC-83200/160	180
4686 128K 192K 256K 384K	686	686	PC-83200/160	180
4786 128K 192K 256K 384K	686	686	PC-83200/160	180
4886 128K 192K 256K 384K	686	686	PC-83200/160	180
4986 128K 192K 256K 384K	686	686	PC-83200/160	180
5086 128K 192K 256K 384K	686	686	PC-83200/160	180
5186 128K 192K 256K 384K	686	686	PC-83200/160	180
5286 128K 192K 256K 384K	686	686	PC-83200/160	180
5386 128K 192K 256K 384K	686	686	PC-83200/160	180
5486 128K 192K 256K 384K	686	686	PC-83200/160	180
5586 128K 192K 256K 384K	686	686	PC-83200/160	180
5686 128K 192K 256K 384K	686	686	PC-83200/160	180
5786 128K 192K 256K 384K	686	686	PC-83200/160	180
5886 128K 192K 256K 384K	686	686	PC-83200/160	180
5986 128K 192K 256K 384K	686	686	PC-83200/160	180
6086 128K 192K 256K 384K	686	686	PC-83200/160	180
6186 128K 192K 256K 384K	686	686	PC-83200/160	180
6286 128K 192K 256K 384K	686	686	PC-83200/160	180
6386 128K 192K 256K 384K	686	686	PC-83200/160	180
6486 128K 192K 256K 384K	686	686	PC-83200/160	180
6586 128K 192K 256K 384K	686	686	PC-83200/160	180
6686 128K 192K 256K 384K	686	686	PC-83200/160	180
6786 128K 192K 256K 384K	686	686	PC-83200/160	180
6886 128K 192K 256K 384K	686	686	PC-83200/160	180
6986 128K 192K 256K 384K	686	686	PC-83200/160	180
7086 128K 192K 256K 384K	686	686	PC-83200/160	180
7186 128K 192K 256K 384K	686	686	PC-83200/160	180
7286 128K 192K 256K 384K	686	686	PC-83200/160	180
7386 128K 192K 256K 384K	686	686	PC-83200/160	180
7486 128K 192K 256K 384K	686	686	PC-83200/160	180
7586 128K 192K 256K 384K	686	686	PC-83200/160	180
7686 128K 192K 256K 384K	686	686	PC-83200/160	180
7786 128K 192K 256K 384K	686	686	PC-83200/160	180
7886 128K 192K 256K 384K	686	686	PC-83200/160	180
7986 128K 192K 256K 384K	686	686	PC-83200/160	180
8086 128K 192K 256K 384K	686	686	PC-83200/160	180
8186 128K 192K 256K 384K	686	686	PC-83200/160	180
8286 128K 192K 256K 384K	686	686	PC-83200/160	180
8386 128K 192K 256K 384K	686	686	PC-83200/160	180
8486 128K 192K 256K 384K	686	686	PC-83200/160	180
8586 128K 192K 256K 384K	686	686	PC-83200/160	180
8686 128K 192K 256K 384K	686	686	PC-83200/160	180
8786 128K 192K 256K 384K	686	686	PC-83200/160	180
8886 128K 192K 256K 384K	686	686	PC-83200/160	180
8986 128K 192K 256K 384K	686	686	PC-83200/160	180
9086 128K 192K 256K 384K	686	686	PC-83200/160	180
9186 128K 192K 256K 384K	686	686	PC-83200/160	180
9286 128K 192K 256K 384K	686	686	PC-83200/160	180
9386 128K 192K 256K 384K	686	686	PC-83200/160	180
9486 128K 192K 256K 384K	686	686	PC-83200/160	180
9586 128K 192K 256K 384K	686	686	PC-83200/160	180
9686 128K 192K 256K 384K	686	686	PC-83200/160	180
9786 128K 192K 256K 384K	686	686	PC-83200/160	180
9886 128K 192K 256K 384K	686	686	PC-83200/160	180
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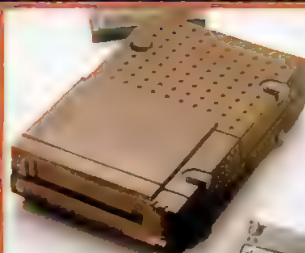
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18904	IBM ThinkPad 755CD, 540MB Dr.	4749
18905	IBM ThinkPad 755CD, 810MB Dr.	5149
25187	MDS 75MHz 850MB HD PCI	1299
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19482	Altac Lansing ACS51	\$79.95
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21401	Matrox Millennium 2M	329
24536	Fracta Design Painter 4.0	179
23929	ValueMedia 6X CD ROM Drive	429

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16661	Adobe Photoshop 3.0	569.95
2618	CoreDRAW! 3.0 CD ROM	79.95
22970	CoreDRAW! 6.0 Upgrade from 5	229.95
19876	Core Gallery 2 CD Windows	79.95
24536	Fracta Design Painter 4.0	399.95
19880	HSC KPT Converter Windows	129.95
24511	HSC Ka's Power Tools 3.0	129.95
21994	HSC Vector Effects-Windows	129.95
22081	Macromedia FreeHand 5.0 CD	399.95
10524	Micrografx ABC Flow Charter	329.95
23016	Micrografx ABC Graphics Suite Upg	149.95
17800	Micrografx Picture Publisher 5.0	279.95
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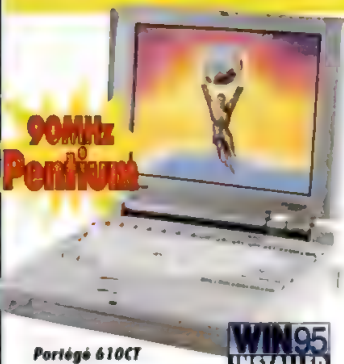
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- Pentium 90MHz processor
- 9.5" True Color display for optimum color
- Built-in 16-bit sound (SoundBlaster Pro compatible), microphone & speaker
- Lithium Ion battery technology
- Accupoint stick for easy control

Processor	Screen	MB	Price
Pentium 90MHz	9.5" True Color	720MB	\$3939

Tecra 700

■ Intel® 120MHz processor

- PCI bus architecture (internal & external)
- 11.3", 800x600 high resolution displays
- Optional 4X CD-ROM Drive (swap floppy & CD-ROM)
- Multimedia docking station with PCI bus (optional accessories priced separately)
- Built-in 16-bit sound, microphone
- 2 speakers & VHS
- HUGE 1.13GB hard drives

Processor	Screen	MB	Price
Pentium 120	11.3" Dual Scan	1.13GB	\$4679
Pentium 120	11.3" Active	1.13GB	\$5949



Satellite 2110/2130

120MHz
Pentium
with PCI bus

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Tecra 700

Satellite 2110/2130

Processor	Screen	MB	Price
486DX4/75	10.4" Dual Scan	330MB	\$1679
486DX4/75	10.4" Dual Scan	500MB	1969
486DX4/75	10.4" Active	500MB	2499

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Screens



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Satellite Pro 400 & Satellite Pro 410

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- Active modes and optional dual scan
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- EDO RAM memory up to 64MB (at Pentium only)
- Built-in 16-bit sound, microphone & speaker
- Integrated Accupoint - small, accurate & easy to use
- Lithium Ion battery technology
- Built-in antenna for wireless communications

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	772MB	\$2999
Pentium 75	10.4" Active	772MB	3999
Pentium 90	11.3" Dual Scan	772MB	\$3499
Pentium 90	11.3" Active	772MB	4679

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ThinkPad® 365CD

ThinkPad® 365

- 10.4" Active (64K colors) & 10.4" Dual Scan
- Built-in infrared for no-hassle printer connections
- Multimedia models include built-in 2X CD-ROM, SoundBlaster compatible audio, speaker, microphone & MIDI/joystick port
- MS Windows 95 or Selecta System models available

Processor	Screen	MB	Price
486DX4/75	10.4" Dual Scan	540MB	\$1999
486DX4/75	10.4" Active	540MB	2599
486DX4/75	10.4" Dual Scan	540MB	2499*
486DX4/75	10.4" Active	540MB	3099*

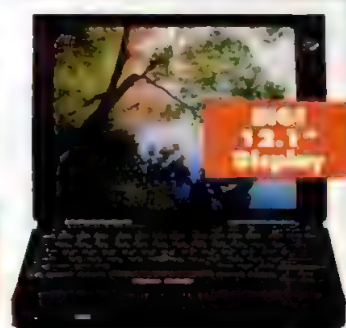
*Multimedia Models

ThinkPad 760

- Pentium 90 & 120MHz with 32-bit local bus
- 12.1" Active displays with 800x600 resolution (selected models)
- 4X CD-ROM Drive (MPEG-2 support, & full motion video (ThinkPad 760CD only))
- Built-in 28.8 fax modem
- SoundBlaster-compatible audio & telephony
- Lithium Ion battery technology

Processor	Screen	MB	Price
Pentium 90	10.4" Active	720MB	\$5349
Pentium 90	12.1" Active	720MB	6049
Pentium 120	12.1" Active	720MB	6599
Pentium 90	12.1" Active	1.2GB	7449*

*Features built-in CD-ROM drive
WIN 95 models available. Call for details.



ThinkPad® 760

hp HEWLETT® PACKARD



HP OmniBook 600
NoteBook PC

HP OmniBook 600

- Weighs **ONLY 3.8 pounds!**
- Built-in 16-bit sound, microphone & speaker (active model only)
- Built-in infrared for no-hassle printer connections
- Lithium Ion battery technology (active model only)
- Instant "ON" ready-to-work state - lasts for months on a charge

Processor	Screen	MB	Price
486DX4/75	9.5" Dual Scan	340MB	\$2539
486DX4/75	9.5" Active	340MB	2999

HP OmniBook 5000

- Pentium 90MHz with 32-bit PCI Local bus
- 1.2GB drives available for high capacity storage
- High resolution - 800x600 resolution on notebook display
- Built-in 16-bit sound, microphone & speaker

Processor	Screen	MB	Price
Pentium 90	10.4" Active	1.2GB	\$5329
Pentium 90	10.4" Active	1.2GB	5889*
Pentium 120	10.4" Active	1.2GB	6539*

*16MB RAM standard

90MHz & 120 MHz
Pentium
with PCI bus



HP OmniBook 5000 NoteBook PC

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NEC

Versa 2000

Processor	Screen	MB	Price
486DX4/75	9.5" Active	350MB	\$2099*
486DX4/75	9.5" Active	350MB	2399
486DX4/75	9.5" Active	540MB	2599

*14.4 fax/modem not built-in

NEC Versa 4000

- Built-in CD-ROM Drive* Standard in some models, optional in others
- Pentium 75 and Pentium 90 processors
- 25.6MB or 256MB optional hard drive
- 15.6" color display - 65K and 1.3M Scan
- 16.8 million color Active (High resolution Active Matrix displays available - 800x600 res.)
- Built-in 16-bit sound, microphone, MIDI and 2 built-in speakers
- Multimedia docking station with external 2 Alice Lansing 4 speaker array system available

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	540MB	\$3499
Pentium 75	10.4" Dual Scan	540MB	3799*
Pentium 75	10.1" Active	540MB	3999
Pentium 90	10.1" Active	810MB	4649*
Pentium 90	10.4" High Res.	810MB	4799

* Features built-in CD-ROM drive



NEC Versa 4000

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as low as
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HiNote Ultra

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- Built-in infrared
- 3 year warranty - **FREE** 1 year Passport Service

Processor	Screen	MB	Price
486DX2/50	9.5" Dual Scan	340MB	\$2549
486DX2/50	9.5" Active	340MB	3079
486DX4/75	9.5" Active	340MB	3319
486DX4/75	9.5" Dual Scan	528MB	3079
486DX4/75	9.5" Active	528MB	3639

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COMPAQ

Contura 420/430

Processor	Screen	MB	Price
486DX4/75	10.4" Dual Scan	420MB	\$2089
486DX4/75	10.4" Active	420MB	2559
486DX4/100	10.4" Dual Scan	720MB	2369
486DX4/100	10.4" Active	720MB	2939

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- MultiBay - holds CD-ROM, 2nd HDD, Floppy, or 2nd battery
- Up to 1.5GB hard drives (2.7GB max capacity)
- Built-in infrared for wireless communications
- Supports SIMM & Lithium Ion batteries (up to 8 hrs.)
- Optional MPEG and TV video adapter

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	510MB	\$3799
Pentium 75	11.3" Dual Scan	810MB	4439
Pentium 75	10.4" Active	810MB	4729
Pentium 90	10.4" Active	810MB	5339
Pentium 90	10.4" Active	810MB	5599*
Pentium 120	10.4" Active	1.35GB	6379

*Features Built-In CD-ROM drive

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LTE 5000



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Ascentia 950N

Ascentia 950N

- 75MHz and 90MHz Pentium for blazing performance
- 10.4" Active & Dual Scan
- High Res displays - 800x600 res. in notebook
- Built-in 16-bit sound, microphone & speaker
- Lithium Ion battery technology
- Built-in infrared for no hassle printer connections

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	500MB	\$2639
Pentium 75	10.4" Dual Scan	800MB	2879
Pentium 75	10.4" Dual Scan	1.2GB	3249
Pentium 75	10.4" Active	800MB	3799
Pentium 75	10.4" Active	1.2GB	4199
Pentium 90	10.4" Dual Scan	800MB	3259
Pentium 90	10.4" Dual Scan	1.2GB	3639
Pentium 90	10.4" Active	800MB	4199
Pentium 90	10.4" Active	1.2GB	4579

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TravelMate 5200

- Pentium 120MHz w/PCIBus
- 10.4" Active Matrix
- 1.2GB Hard Drive
- Only \$5099**

Extensa 550/550CD

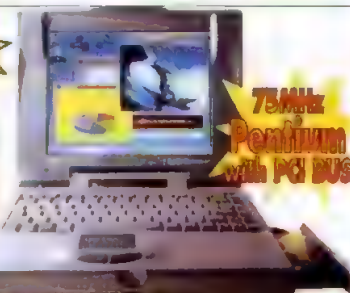
- 75MHz Pentium w/PCI bus & 256KB cache
- Built-in 2X CD-ROM drive (optional on some models)
- Built-in 16-bit sound, microphone & speaker (optional on some models)
- Integrated touchpad pointer
- 10.4" Active Matrix & 10.4" Dual Scan
- Built-in infrared for wireless communications

Extensa 550
as low as
\$2449*

Processor	Screen	MB	Price
Pentium 75	10.4" Dual Scan	524MB	\$2449*
Pentium 75	10.4" Dual Scan	524MB	2939
Pentium 75	10.4" Active	524MB	3519

*CD-ROM Drive is an optional accessory on this model

Extensa 550CD



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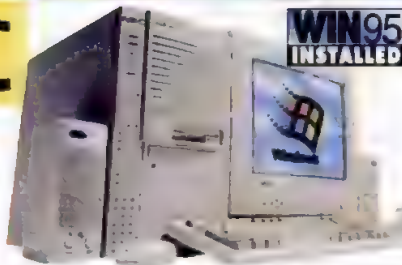
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- Quad Speed CD-ROM drive
- 16-bit, 3-D surround sound system
- 28.8 fax/modem, full-duplex speaker phone & answering machine
- Superfast 64-bit PCI local bus graphics
- Built-in MPEG support for full screen, full motion video
- 42-bit PCI IDE controller - fast disk performance
- LOADS of **FREE** software

Class	Processor	RAM	Price
Minitower	Pentium 75	1GB	\$1899
Minitower	Pentium 100	1GB	2199
Minitower	Pentium 100	1.6GB	2599*
Minitower	Pentium 120	1.6GB	2799*
Minitower	Pentium 133	1.6GB	2999*

Monitors priced separately *16MB RAM Standard

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Advantage Adventure Multimedia (4X CD-ROM)

- Quad Speed CD-ROM Drive
- Advanced Telephony - 14.4 or 28.8 fax/modem, telephone answering system, and speaker phone (Differs by model. Call for details)
- Integrated 3-D surround sound system
- Loads of **FREE** software pre-installed
- Windows 95 keys and/or increased productivity
- AST Works II navigation software - featuring "SPOT"
- Intel P6 OverDrive processor upgradable

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Class	Processor	RAM	Price
Desktop (614)	Pentium 100	850MB	\$1679
Minitower (812)	Pentium 100	1.2GB	1819
Minitower (814)	Pentium 100	1.2GB	2109*
Minitower (816)	Pentium 133	1.6GB	2589*
Minitower (818)	Pentium 133	1.6GB	2679*

Monitors priced separately *16MB RAM standard

AST Advantage



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JBL Speakers**

Digital Starion



Digital Starion NEW! Windows 95 Multimedia Computers

- Quad Speed CD-ROM Drive
- Up to Pentium 133 - fastest Pentium available!
- PCI local bus - high speed graphics
- Unbelievable sound - SoundBlaster Pro-compatible SW WaveTable, Premium JBL speaker system
- Advanced Telephony - 14.4 fax/modem, full duplex speaker phone & answering machine (not duplex in model 917)
- Loads of **FREE** software pre-installed

All New Models!

Class	Processor	RAM	Price
Minitower (911)	Pentium 75	1.2GB	\$1799
Minitower (917)	Pentium 100	1.2GB	1999
Minitower (922)	Pentium 75	1.2GB	2199*
Minitower (931)	Pentium 100	1.6GB	2499*
Minitower (932)	Pentium 120	1.2GB	2599*
Minitower (933)	Pentium 120	1.6GB	2699*
Minitower (940)	Pentium 133	1.2GB	2799*
Minitower (2001)	Pentium 133	1.6GB	3099*

Monitors priced separately *16MB RAM standard

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Aptiva® Multimedia

- Quad Speed CD-ROM Drive
- 16-bit Stereo sound - SoundBlaster Compatible
- Advanced Telephony - 28.8 fax/modem, full duplex speaker phone, answering machine & voice mail
- 30 Watt stereo speakers
- Built-in MPEG support for full screen, full motion video
- Over 40 **FREE** software titles

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Class	Processor	RAM	Price
Minitower	Pentium 75	1GB	\$1799
Minitower	Pentium 100	1.6GB	2299
Minitower	Pentium 120	1.6GB	2399
Minitower	Pentium 100	1.6GB	2599*
Minitower	Pentium 133	1.6GB	2899*

*16MB RAM standard

Monitors priced separately



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Packard Bell Force

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NEW! Windows 95 Multimedia Computers

- Quad Speed CD-ROM drive
- 16-bit SRS 3-D Amphitheatre Stereo sound
- PCI local bus, high-speed graphics
- Telephone answering system & fax/modem (full duplex speaker phone in selected models)
- LOADS of **FREE** software

Class	Processor	RAM	Price
Minitower	Pentium 75	1GB	\$1669
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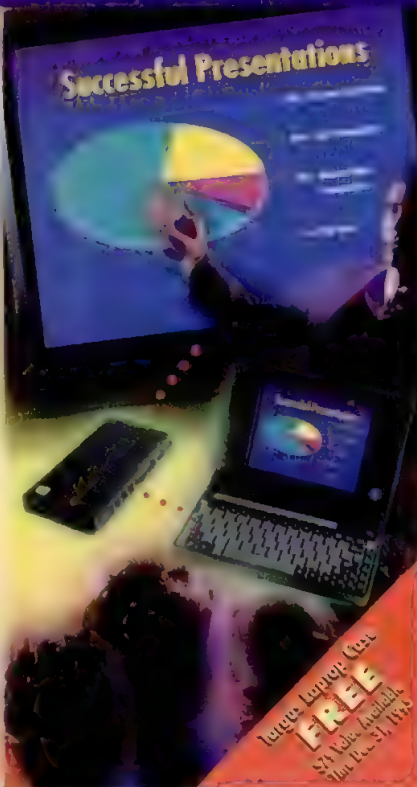
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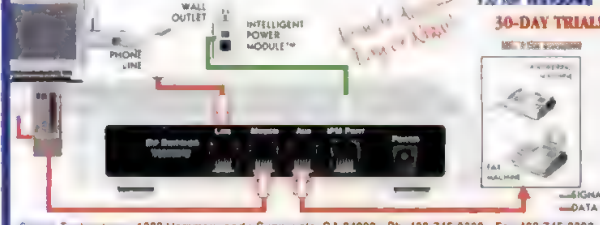
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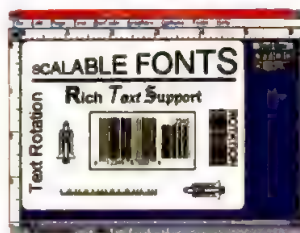
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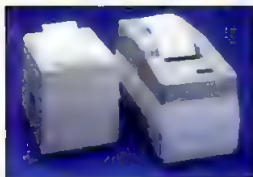
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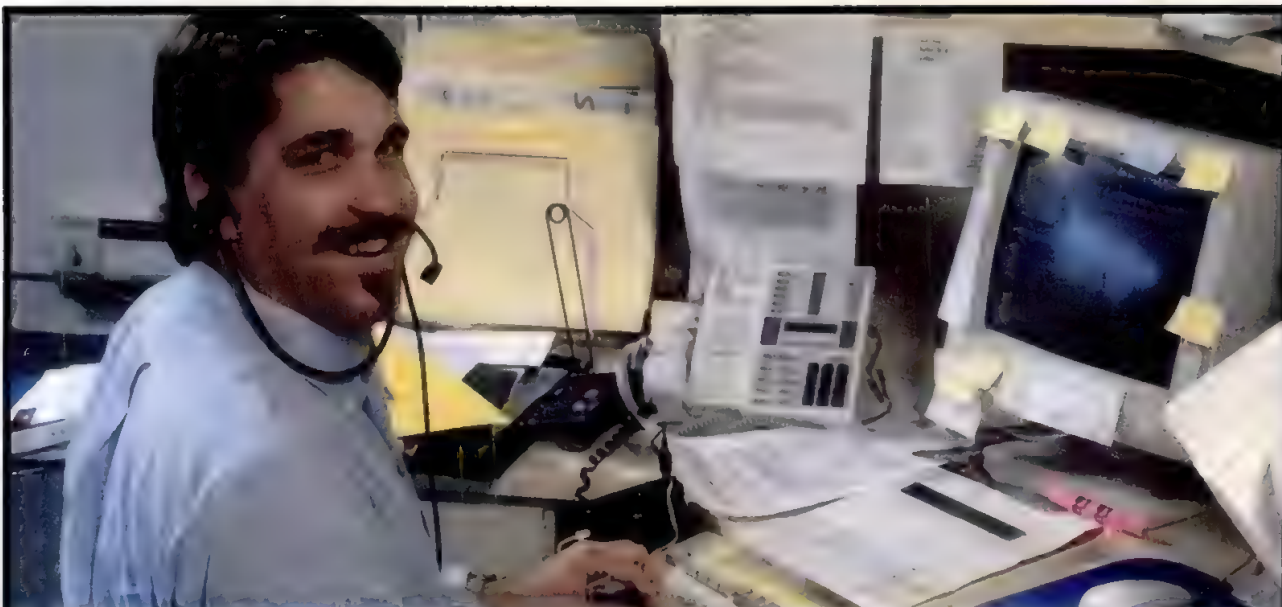
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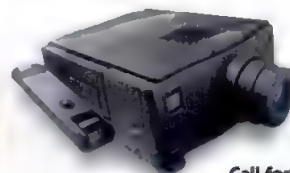
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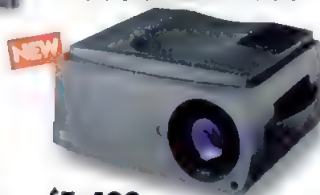
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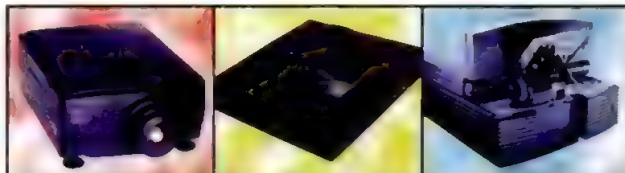
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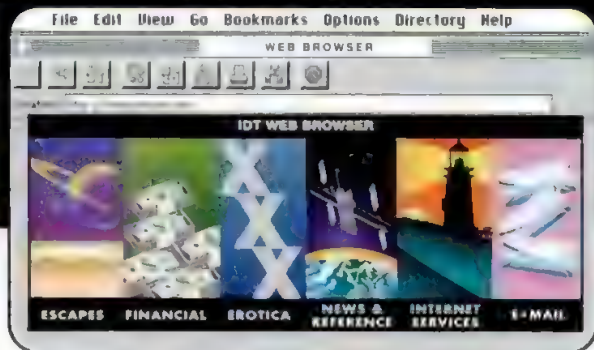
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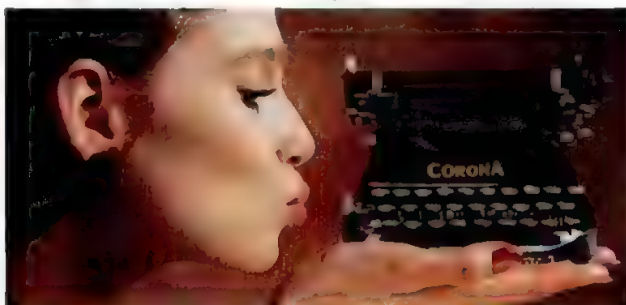
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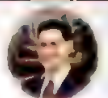
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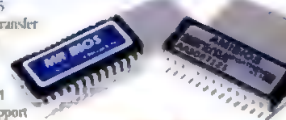


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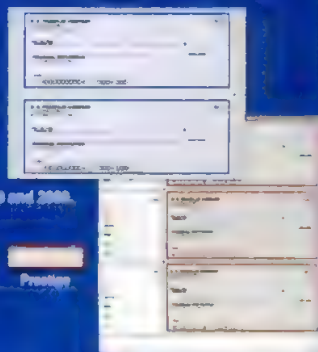
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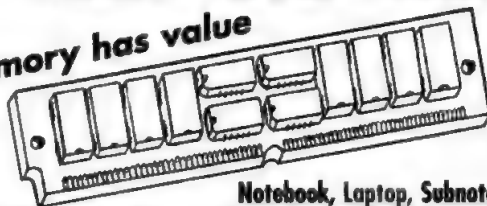


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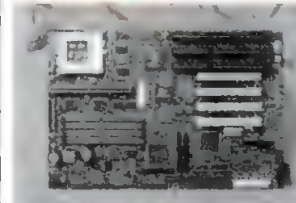
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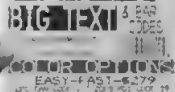
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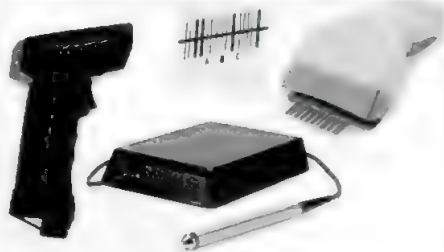
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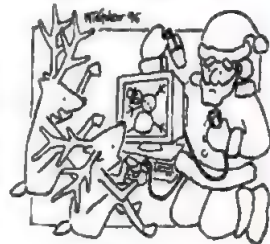
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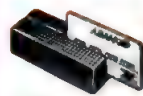
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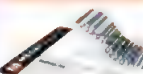
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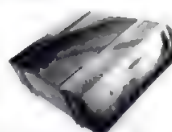
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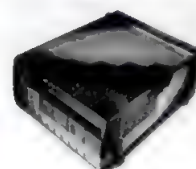
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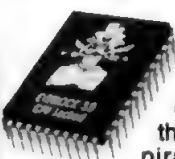
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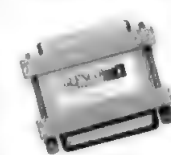
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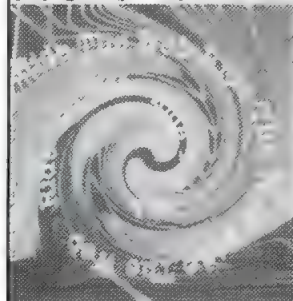
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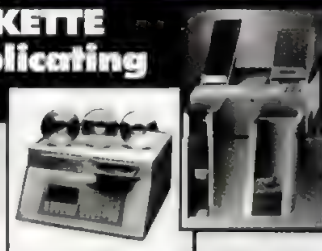
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After Hours

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DOS

Windows

CD-ROM

Resource-Intensive

Adult Content

Kids (Ages)

Price

Action Games: Not All DOOM Clones

Action games offer a great release for the anxieties of a rough workday, which is one of the reasons behind the incredible popularity of first-person shoot-em-ups like DOOM, Dark Forces, and Descent. But if all these games start to look and play the same after a while, you should load up one of the four action titles we've gathered here. Some introduce a new point of view, some add a heavy dose of strategy, and one goes for the simple arcade style, but all four are good alternatives to the DOOM-style action game.

Crusader: No Remorse

Origin Systems; 800-245-4525;
Web, <http://www.ea.com/origin.html>.

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★★★★★

The basic premise behind Crusader: No Remorse is a familiar one: Destroy everything. But thanks to specific elements—an intricate plot and smooth scrolling and SVGA action viewed from a skewed overhead angle—Crusader comes across as something new and different.

The game takes place in a future where the totalitarian regime of the World Economic Consortium (WEC) finds fault with pretty much anything fun. A former WEC enforcer, you've had your fill of killing innocents and join the growing Resistance movement. They don't quite believe you're on their side, so you have to prove it by completing missions.

Each mission unfolds in a richly detailed, dynamic environment where just about

everything can be used, taken, or destroyed. You can interface with computers, set a chair spinning with a stray bullet, and deactivate force fields.

WEC guards, technicians, and robots populate each level, and all of them can be taken out. It's not always a good idea to kill indiscriminately, though, since some folks you encounter will have information you need. Back at the Resistance base, you can talk to your new comrades and get more weapons.

The game's biggest drawback is its reliance on a host of keyboard controls. With 16 basic functions to master—



including crouching, picking up objects, and detonating bombs—it took us while to get the hang of things. Still, Crusader is a well-designed game and a lot of fun.—Shane Mooney

Fade to Black

Electronic Arts; 800-245-4525;
Web, <http://www.ea.com/fadeinfo.html>.

Circle 478 on reader service card

★★★★★

Fade to Black is a sci-fi thriller in which you play the role of Conrad B. Hart, the hero of Flashback (which

came out for the PC a few years back). Fifty years after tackling the shape-shifting Morphs, Conrad is awakened from cryogenic sleep to discover that his archenemies are alive, well, and basically all over the place.

Over the course of 13 levels, you'll take on the Morphs as you try to complete a series of missions. The storyline is elaborate, well-developed, and interesting, as are each of the levels. The game provides an excellent mix of adventure- and action-gaming traits, so that you have to solve a bunch of basic puzzles, but you also have to wipe out lots of bad guys.

Throughout the game, you'll get a rather unique view of the action through multiple camera angles and an intriguing 3-D polygon-based graphics engine. At times you look right over Conrad's shoulder; at other times you get a more distant view of an entire hallway. The automatic switching of camera angles is incredibly disorienting, however.

IN AFTER HOURS

Action Games: Not All

Doom Clones

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After Hours

Also, the player controls are extremely complex, even more so than in *Crusader*. Whether you use a keyboard, joystick, or mouse, it will take you a while to get used to all the commands necessary to make Conrad do what you want. *Fade to Black* also suffers from a few other minor flaws, such as requiring you to manually reload a gun that has unlimited ammo.

If you can look beyond minor gripes and have the patience to master the controls, you might just find yourself hooked by the story and the action.—*Michael E. Ryan*

Magic Carpet II: The Netherworlds

Electronic Arts; 800-245-4525; Web, <http://www.ea.com/magic-car.html>.

Circle 479 on reader service card

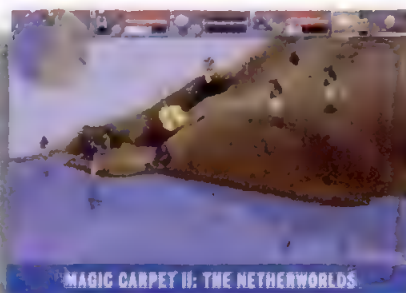
★★★★  \$59.95

Like the first two products in this review, *Magic Carpet II: The Netherworlds* provides a rich storyline as the backdrop for high-flying ac-

tion. In this case, the Master Demon is wreaking havoc in our plane of existence, so you have to do battle with him by completing a series of tasks in his power base, the *Netherworlds*.

You must complete 25 tasks in a variety of landscapes, ranging from nighttime cityscapes to volcanic caverns. These environments are wonderfully detailed and populated by a variety of people and creatures (from goats to six-headed hydras)—each of which can be good, bad, or neutral. The graphics are excellent and the speed at which they move is stunning.

Along your journey, you'll have to discover new spells and gather mana, which is released by the living creatures you vanquish. You need to build castles in which you can store the mana, and the defense of those castles adds a



strategic element to the game.

Despite utilizing a fairly complex set of controls, *Magic Carpet II* is much easier to master than either *Crusader* or *Fade to Black*. Still, you will need to get used to the ultra-sensitive steering on your magic carpet. Don't even think about playing this one if other first-person games give you motion sickness.

Magic Carpet II offers good multiplayer options, with support for up to eight players over a NetBIOS network. The game also ran very well under a DOS box in Windows 95, while *Fade to Black* behaved erratically on that platform and the other two titles reviewed here did not run at all.

Finally, *Magic Carpet II* supports the Virtual i-O i-glasses headset, to provide an even more intense first-person experience.—*Michael E. Ryan*.

Mortal Kombat 3

GT Interactive Software; 800-610-4847; Web, <http://www.gtinteractive.com>.

Circle 480 on reader service card

★★★★    \$50

Sometimes, the best type of game is one that requires fast reflexes and very little thought. Few games fill that bill

better than *Mortal Kombat 3*. If you haven't already heard of the game (or at least the series), this is a straightforward martial-arts fighting game that pits you against the computer or other players in a winner-take-all tournament.

Based on the arcade game of the same name, *Mortal Kombat 3* is a startlingly accurate representation of its coin-op cousin. No detailed plot here, just a lot of punching, kicking, and the ever-present "secret moves."

The graphics are very



good—although not quite as good as those found on the Sony PlayStation version. The sound and music, however, are excellent. The PC version also offers something the video game-console versions do not: network play for up to 12 players over an IPX LAN.

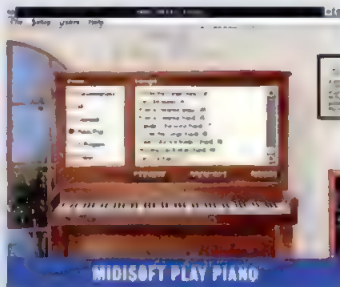
The *Mortal Kombat* series has a reputation for graphic violence, and while that reputation has been a bit exaggerated, there are several animations that you might not want your kids to see. These tend to play when your character has been beaten, and can be quite explicit. On the other hand, some of these scenes can be pretty funny (such as the "babalities").

For flat-out arcade action on the PC, you'll have a hard time finding a better game than *Mortal Kombat 3*. It packs quite a punch.

—*Michael E. Ryan*

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—*Bill Dyszel*

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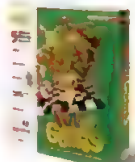


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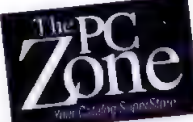


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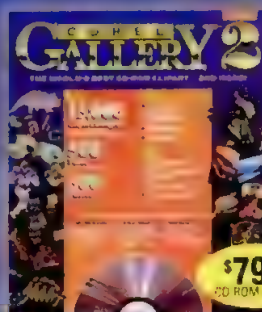
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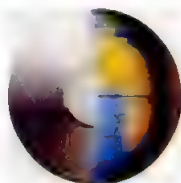
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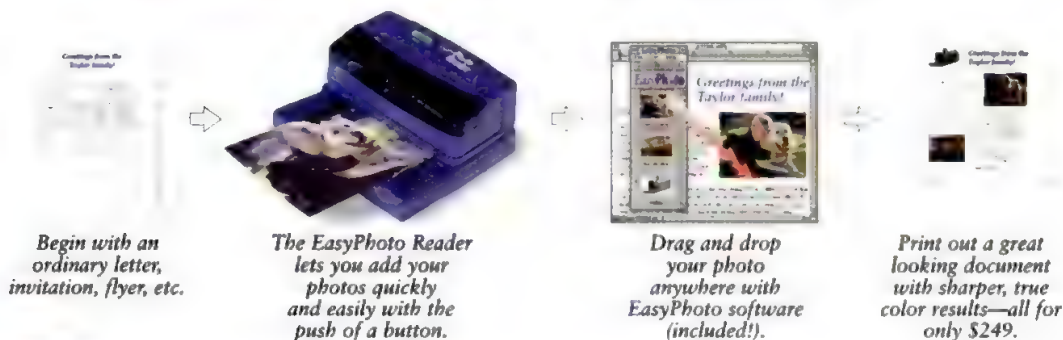
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After Hours

See title for children ages 12 to 24 months, features colorful shapes and cartoon characters and is designed to teach the principles of cause and effect. For example, if your child presses the button with the rain cloud on it, rain will appear on the screen. Rolling the bar at the top of the screen causes various animations to play on-screen—the faster the roller is moved, the faster the animations play.

Feely's Birthday, a Comfy-land title for children ages 2 to 6, is designed more like a traditional kids' adventure game and delves into concepts such as cooperation and responsibility.

When using the software, your child will see different results depending on which level you set: Under the simplest level of The First Step, for example, a green triangle appears on the screen when your baby presses the green button on the keyboard. In a subsequent level, the triangle turns into a pine tree.

The keyboard plugs into your computer's parallel port. A parent will need to attach the keyboard and install the CD, at least initially, but older children should be able to follow Comfy's instructions on their own. You will, of course, need to monitor infants and toddlers so they do not fall off their chairs or grab PC components not designed for busy little hands.

Our 15-month-old tester was immediately intrigued by the Comfy keyboard and started hitting buttons even before it was plugged in. The addition of sound and color made the process even more fascinating for her. All in all, on a rainy day, your child could do a lot worse than spend time in the friendly, entertaining, and educational Comfy world.

—Jenny Donelan

Strategy

Real-Time Combat

Command & Conquer

Virgin Interactive Entertainment; 800-874-4607; Web, <http://www.westwood.com/cc1/cc1info.html>.

Circle 481 on reader service card

★★★★   \$79.95

Command & Conquer is an enthralling game of tactical combat. The story, set in the near future, has the Global Defense Initiative at war with the Brotherhood of

Nod over a mysterious substance called Tiberium.

You can play either side of the conflict, commanding a slightly different set of troops and weapons depending on your choice. The game gives you a bird's-eye view of the battlefield. All actions play out in real time, which makes gameplay especially tough.

The commands are simple: You can move a unit or make it attack an enemy. You can also harvest Tiberium to earn money. The computer opponents are relentless and crafty,

but if you find them boring, take on a human opponent via modem or IPX network.

From its flashy install pro-



gram to its easy-going system requirements, Command & Conquer is a well-polished game. It even runs beautifully under Windows 95.

—Bernard H. Yee

SPOTLIGHT ON SPORTS

NHL 96

Within the recent flurry of hockey games for the PC, NHL 96 clearly stands head and shoulders above the rest. It has everything: great graphics and sound, fast-paced action, and an accurate statistical model.

You get to take the reins of an NHL team and guide them through an entire season and the playoffs. The new Islander and Capital uniforms are included, but the Quebec

Nordiques are still around (even though they are now the Colorado Avalanche in real life). You can create your own players, make trades for others, and change your lineup at will.

The graphics engine has been completely redesigned in exquisitely detailed SVGA and includes brand-new player animations. The players each have real numbers on their jerseys, team logos decorate the ice, and there are even ads on the boards.

The sound effects are startlingly lifelike, and the announcer's voice really conveys the feeling that you're at a live game.

You get a choice of several camera angles, most of which move and swoop over the ice

as the action unfolds. One looks like the view you see while watching hockey on TV.

The gameplay is excellent and challenging—much more difficult than in previous versions. Even fighting is back, complete with some special moves. In general, the computer-controlled players employ decent AI, although those on your own team don't seem to know what the term fore-check means. Also,

it's not always easy to get control of the player who's *really* closest to the puck.

The game's statistical model is vastly improved and generates very realistic numbers. One gripe we had was the lack of goalie scoring stats, since our Tommy

Salo had five goals in a season.

If you're a hockey fan, you owe it to yourself to check out NHL 96. Even if you don't follow the sport, you may be stunned by the quality of this game. —Michael E. Ryan



Electronic Arts, 800-245-4525; Web, <http://www.ea.com/nhl96.html>.

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★★★★    \$64.95

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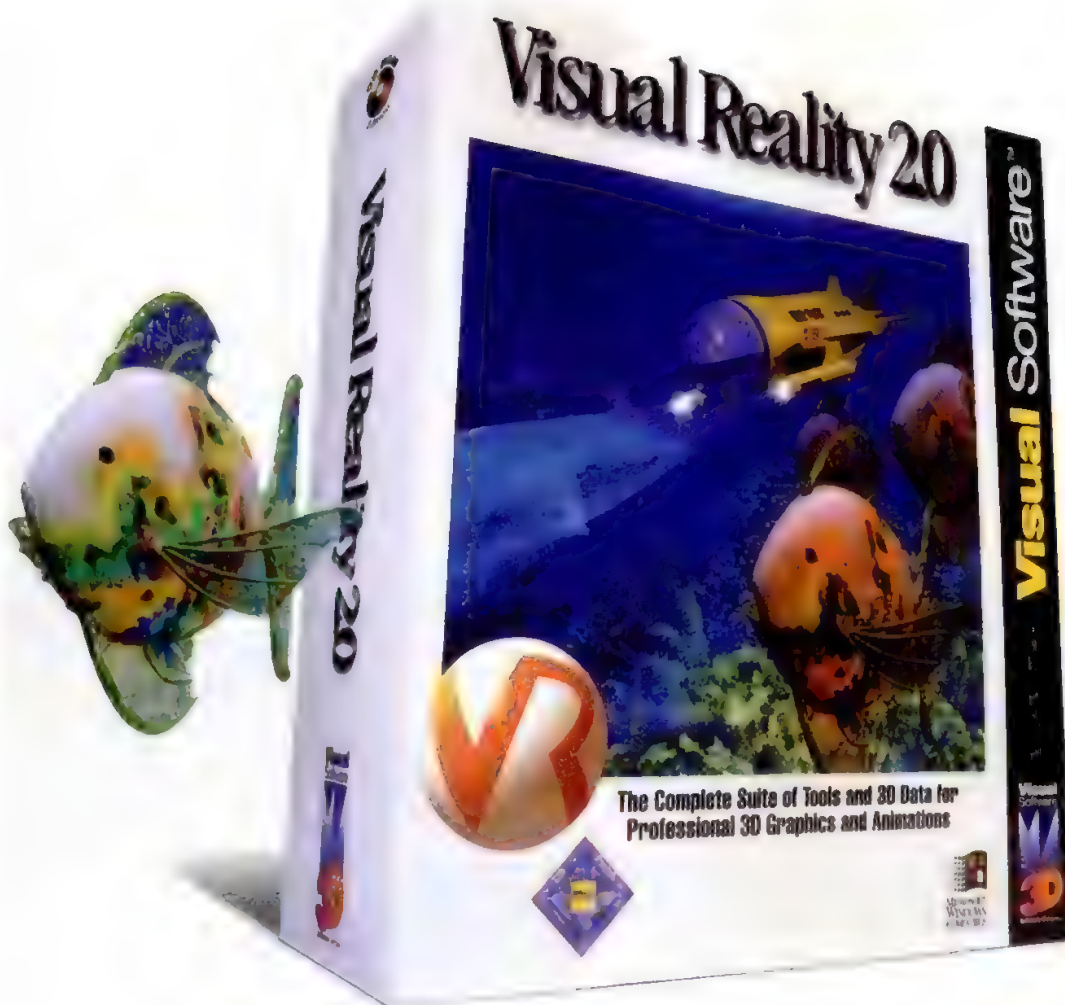
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Coming Up

Color Portables

Pentium notebooks are poised to take the portables market by storm. With processor speeds ranging from 75 MHz at the low end to 133 MHz at the high end, you can find a Pentium-powered notebook to suit just about any wallet and computing style. With both internal and external PCI bus support, secondary processor cache, and EDO and synchronous DRAM, these new portables are coming closer than ever to desktop performance. In addition, new, modular case designs let you swap CD-ROM drives, batteries, floppy disk drives, hard disks, and even MPEG modules to build a notebook that suits your needs. We test over 40 of the newest Pentium-powered portables to see which ones deserve a place in your briefcase.

CD-ROM Drives

Once a power user's toy, CD-ROM drives are now a standard multimedia component. But if you're trying to keep up with the Joneses, don't get too comfortable with the quad-speed drive you may have just purchased. Most vendors, including Creative Labs, NEC, Plextor, and Toshiba, are now introducing sextuple-speed drives, and Diamond offers a full multimedia kit with an 8X drive. We tell you if the increased speed delivers a difference worth paying for.

Personal Finance Software

If you've been holding your breath for the day that you could step out of your bank and lean on your PC to manage your money—your accounts, checks, bills, loans, investments—go ahead and breathe. Not only do personal finance software packages today offer better-than-ever electronic banking and Internet connections, but they've shaped sharper interfaces to guide you through their programs step by step; they have also expanded educational resources to encompass even more financial information. This year, we review five personal finance packages that aim to make your financial life—and future—friendlier, and we also present a slew of financial software specialties that range from expense reporters and investment trackers to wealth builders and retirement planners.

New OCX Controls

The recent launch of Microsoft Visual Basic 4.0 inaugurates the OCX control, an OLE-based successor to the widely adopted and wildly successful .VBX control format. In the first installment of a two-part story, we test seven core controls and environment enhancements from Crescent, Desaware, and Sheridan

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Press Releases We Never Finished Reading

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Richard Tennant

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